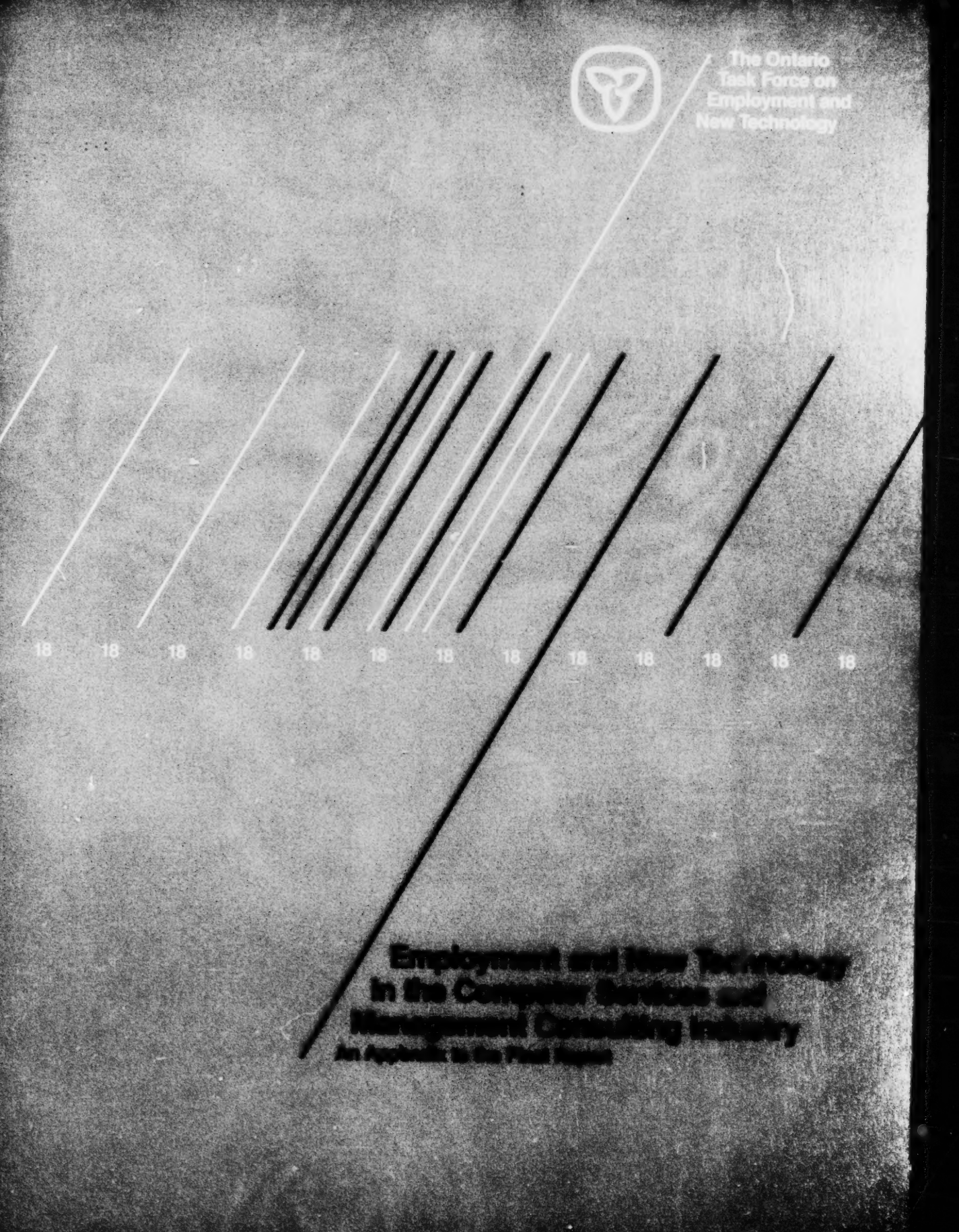

Employment and New Technology in the Computer Services and Management Consulting Industry

An Appendix to the Final Report

86-03665/

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APPENDIX 18

EMPLOYMENT AND NEW TECHNOLOGY

IN THE COMPUTER SERVICES AND MANAGEMENT CONSULTING INDUSTRY

This Appendix contains a report prepared for the Ontario Task Force on Employment and New Technology. The topic was approved in advance by the Task Force. At the conclusion of the study, the Task Force had the opportunity to review the report, but its release does not necessarily imply endorsement of the results by the Task Force or its individual members.

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FOREWORD

The Ontario Task Force on Employment and New Technology, a joint labour-management group, was established in May, 1984, "to consider and report on the manpower and employment implications of new technologies as the same may be introduced and applied in Ontario during the next decade and the extent and nature thereof."

To inform its discussions, the Task Force established a research agenda designed to gather information on employment and technological change from a wide variety of sources. The research agenda contained projects which gathered information of a historical nature, and projects with a future orientation which were designed to gather information describing likely occupational and employment implications associated with technological change in the 1985-1995 period.

The Appendices to the Final Report of the Ontario Task Force on Employment and New Technology contain reports of these research projects. A complete list of these Appendices may be found at the end of this document.

Among the Appendices are reports of a series of studies to assess the extent and nature of the employment implications of new technology in selected industries in Ontario. Appendix 3 describes the process by which the industries were selected, and contains the studies' terms of reference which called for particular attention to selected new technologies and occupational groups. Appendices 4-18 contain reports of these industry studies, which were conducted by Currie, Coopers & Lybrand, management consultants.

This particular appendix contains a report of the study on the Computer Services and Management Consulting Industry.

Dr. Richard L. E. Brown, P.Eng.
Research Director

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The Board of Industrial Leadership and Development (BILD) of the Government of Ontario.

The Ontario Manpower Commission.

The Ontario Ministry of Labour.

The Task Force would like to thank the staff of Currie, Coopers & Lybrand, particularly Maureen Farrow and Victor Rocine, whose assistance in the conduct of this study is greatly appreciated.

Special thanks are due to all industry experts and survey respondents who provided information for this study.

EMPLOYMENT AND NEW TECHNOLOGY IN THE COMPUTER SERVICES AND MANAGEMENT CONSULTING INDUSTRY

A Report Prepared by Currie, Coopers & Lybrand
for the Consideration of the Ontario Task Force
on Employment and New Technology

July 1985

Submitted By: Maureen Farrow
Mike Applin

Currie, Coopers
& Lybrand
Management
Consultants

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EMPLOYMENT AND NEW TECHNOLOGY IN THE COMPUTER SERVICES AND MANAGEMENT CONSULTING INDUSTRY

PART I - INTRODUCTION AND METHODOLOGY

1.0 INTRODUCTION

This report is one of a series of industry reports which summarize the findings of a major research project[1] undertaken for the Ontario Task Force on Employment and New Technology. Each report includes a historical analysis and an outlook to 1995 for the industry, and a review of the anticipated impacts of new technology on employment.

1.1 Structure of This Report

This report presents the study findings for Ontario's Computer Services and Management Consulting Industry. Computer Services (SIC 853)[2] is discussed separately under Section I followed by Management Consulting (SIC 867)[2], under Section II. The report includes four parts.

- The first part (Chapter 1.0) is the Introduction which includes a description of the approach and methodology.

- The second part (Chapter 2.0) is a Historical Analysis for the industry from 1971 to 1984 which provides background and a perspective on the industry's historical development.

- The third part (Chapters 3.0 to 7.0) discusses the results of the survey of firms in the industry and incorporates the interview findings with industry experts. These chapters cover:

---

1 Manpower and Employment Implications of New Technologies in Selected Industries in Ontario to 1995. The terms of reference of this assignment can be found in Appendix 3 to the Task Force's final report.

2 1970, Standard Industrial Classification (SIC), Statistics Canada.

- a review of recent and anticipated technology adoptions,

- the outlook for the industry to 1995, including expected output and employment levels,

- effects on employment of new technology such as anticipated occupational shifts and changes in required skills,

- a review of the labour relations environment as it relates to new technology, and

- observations on planning efforts for technological change in the industry.

- Part four of the report includes various appendices that support the text of individual chapters.

1.2 Study Approach

The study approach selected incorporates the following research techniques:

- analysis of published statistics and reports on the industry, augmented by the working knowledge of industry specialists within Currie, Coopers & Lybrand,

- in-depth interviews with management and labour experts in the industry, conducted at various stages in the project, using structured interview guides, and

- an industry survey.

The reasons for the choice of these techniques are explained below.

1.2.1 Historical Analysis

The purpose of the historical analysis was to provide an informed perspective on the industry from which to view future trends. The historical analysis covers: the economic environment, competitive factors, output and employment patterns, productivity, technology adoption and the industrial relations environment. In order to permit cross industry analysis, consistent indicators and data sources were used.

1.2.2 Expert Interviews

At various stages in the project, a series of in-depth interviews were conducted with industry leaders, industry associations and union representatives. These experts have a broad understanding of the industry in terms of both its historical development and its future outlook. Their input assisted in the preparation of the historical analysis and in the survey design, and facilitated a clearer interpretation of the survey results.

1.2.3 Sample Survey of Firms

The following describes the key features of the survey.

Ontario firms in the Computer Services and Management Consulting Industry were identified. The sample frame for the survey of Computer Service firms included full members of the Canadian Association of Data Processing (CADAPSO) with operations in Ontario.[1] These firms are estimated to include approximately 70 percent of the sales in the industry.[2]

---

1 Ontario operations were identified through CADAPSO membership files and telephone directories. Employment of individual firms was estimated by correlating a sample of firms using Dun & Bradstreet data on employment with revenue data from CADAPSO.

2 The 1981 Census shows 16,775 residents employed in SIC 853 in Ontario.

The Management and Business Consultants Industry (SIC 867) included consultants in actuarial, personnel, customs, economics, public relations and management services. The sample frame includes all firms with twenty (20) or more employees in Ontario.[1] These firms (i.e., with 20 or more employees) represent approximately half of the 11,000 Ontario employees in this industry.[2]

A representative, random sample of firms, stratified by employment size categories (see Appendix A), was chosen from the sample frame. Tables 1 and 1A show the number of firms in the sample frame, by size. The senior executive officer of each firm was identified and a structured questionnaire was sent to this individual. A copy of the survey questionnaire is attached as Appendix B, together with an outline of the number of responses by question.

Consultants provided ongoing assistance to respondents, both on the telephone and in person, to complete the questionnaires. The questionnaire survey process generally ended with a personal interview. The number of firms who participated in the sample survey are shown in the tables opposite.

In most cases, several participants in each organization contributed to the completion of a questionnaire. An average of 1.4 participants contributed to each

---

1 The source for these firms includes members of the Canadian Association of Management Consultants, The Financial Post 500, Summer 1984, the Canadian Public Relations Society, Dun & Bradstreet and the Canadian Association of Customs Brokers. Employment data were supplemented through telephone surveys.

2 The 1981 Census shows 10,975 residents employed in SIC 867 in Ontario.

TABLE 1: COMPUTER SERVICES SIC 853

Number of Firms and Unions Responding
By Firm Employment Size

Firms by Employment Size	Firms	Unions	Firms in Sample Frame
Small (20-199)	6	0	36
Medium (200-999)	0	0	5
Large (1000+)	0	0	0
Total Firms	6	0	41

TABLE 1A: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Number of Firms and Unions Responding
By Firm Employment Size

Firms by Employment Size	Firms	Unions	Firms in Sample Frame
Small (20-199)	6	0	32
Medium (200-999)	2	0	8
Large (1000+)	0	0	0
Total Firms	8	0	40

questionnaire, both for the Computer Services Industry and for the Management Consulting Industry. The Computer Services principal participants had an average of 12 years' experience with their firms and 19 years in the industry and the Management Consulting principal participants had an average of 22 years' experience with their firms and 23 years in the industry.

The sample survey results have been weighted up to the number of firms in the sample frame. That is, the survey results reported herein refer to the weighted survey results and are, therefore, representative of firms with 20 or more employees in the Computer Services and Management Consulting Industry (SIC 853 and SIC 867) in Ontario. Reliability of each sample is estimated at 90 percent, with a 17 percent allowable error for Computer Services and 95 percent with a 6 percent allowable error for Management and Business Consultants. See Appendix C for an explanation of the sample reliability calculation method.

Readers should be cautioned about the nature and reliability of the sample survey results. The questionnaire included a set of questions asking respondents about the future (i.e., five and ten years ahead) from a particular point in time. The results are, therefore, a representative sample of views about, and expectations for, the future and should not be viewed as what will necessarily take place. The survey provides a useful perspective from which to better understand how the industry perceives the future of new technology adoption and its anticipated impacts on employment.

The next chapter of the report discusses the historical analysis and subsequent chapters review the results of the sample survey and expert consultation which discuss the anticipated trends for the period 1985 to 1995.

SECTION I - COMPUTER SERVICES

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of computer service industry trends for the period 1971 to 1981 and 1982 to 1984.

2.1 The Structure of the Industry

The computer services SIC 853 classifies computer service companies into two main groups; those primarily engaged in the provision of computer services and those primarily engaged in the rental or lease of EDP (electronic data processing) hardware. Computer services include processing services, input maintenance, and other software and systems services (including computer-related education services, computer facility management, feasibility studies, etc.). Lease or rental of EDP hardware includes EDP hardware and peripherals purchased or manufactured by own company in Canada for lease, rental or sale. Equipment maintenance services are included here.

In 1981, Statistics Canada reported 1,392 establishments in Canada engaged primarily in providing computer services, with total operating revenue of $1.1 billion. Ontario accounted for 630 firms and 58.4 percent of revenue.

It is particularly important to note that most companies operate in both service and rental areas; however, unless official statistics are reported for each separate activity, companies are classified according to their primary area of involvement.

A small percentage of companies in this industry are responsible for the majority of the revenue. In 1982, less than 1 percent of all firms accounted for over 43 percent of revenue. At the bottom of the pyramid, the majority of firms have fewer than five employees, and an average revenue of less than $500 thousand.

It is interesting to note that, despite revenue size, businesses with fewer than 20 employees offered a remarkable range of services. By contrast, larger firms concentrated on the processing of data, with consulting services a distant second.

The second group of businesses, those which are primarily concerned with the lease and rental of EDP hardware and equipment, reported that, in 1982, the bulk of their revenue was from sales, followed by revenues from lease and rental of equipment. The number of companies in Canada remained largely unchanged at around 30 between 1978 and 1981. This increased to 56 firms in 1982 as a result of 17 new businesses and because of the re-classification of 16 others from computer service firms to EDP lease and rental firms.

There are so few firms in the EDP equipment lease and rental business that, in order to preserve respondent confidentiality, no breakdown is available of their activities by province. The activity of the total computer services industry in Ontario was arrived at by estimating the output of the EDP equipment lease and rental business. As computer service revenues in Ontario represented 55 percent of total Canadian computer service revenues in 1982, it was assumed that EDP lease and rental revenues in Ontario also represented 55 percent of the Canadian total.

It should also be noted that EDP equipment rental and lease revenues in Canada represent approximately 58 percent of total computer service revenues in Canada. The same proportion applies in Ontario.

2.2 The Market Environment

The market for computer services and leased or rented EDP hardware underwent a fundamental restructuring in the period from 1971 to 1981. In the late 1960's and early 1970's, the market was generally concerned with selecting a technical environment (hardware, systems software, etc.) as offered by one or other of the major EDP equipment manufacturers. The decision to rent, lease, or purchase EDP equipment, or use a computer services firm which provided services using the selected manufacturer's equipment was secondary. In limited areas only, for example in on-line banking, the selection was based on the availability of application programs which operated either on EDP equipment manufacturers' hardware or were available through a service bureau.

In the period from 1975 to the present, application software has improved greatly, both in terms of the scope of business functions supported by pre-programmed software packages, and the quality of the packages. This has resulted in the availability of application software becoming a dominant selection factor in this market.

The markets for computer services and rental or lease of EDP hardware extend to virtually all sectors of public and private enterprise who benefit from automated information processing. Reductions in price have made information technology available to almost all organizations regardless of size by 1984. By comparison, in the early 1970's few organizations under $5 million in annual revenue could justify an investment in computerization.

Suppliers of EDP equipment for rent or lease in Canada fall into two distinct groups. The first comprises primary manufacturers of EDP equipment where IBM dominates. Other principal suppliers are also domestic subsidiaries of United States based manufacturers, although there is a small presence of suppliers from the United Kingdom, Japan, Italy, Germany and the Netherlands. Some of these suppliers rent or lease EDP equipment directly, while others offer leases only through third party equipment leasing firms. Over the past four years, there has been a trend toward equipment purchase. Computing equipment suppliers have structured their pricing to encourage the move from rental and lease to more direct purchase.

The second group of suppliers consists of the remarketers, who acquire new and used equipment and offer it on a lease basis to customers. These firms are predominantly United States owned and based, and, in addition, often act as third party financers of new equipment.

The EDP equipment renting and leasing business has extremely high barriers to entry in the form of required technology, capital, and long lead times. By contrast, the remarketing and leasing firms face relatively low barriers to entry but the risk is higher.

By contrast, computer services firms are typically Canadian owned. In the 1971-1975 period, many firms were independently owned and their primary business was providing computer services. Since 1975, many computer service firms have been acquired by large organizations, particularly those in the financial services industry.

Some computer services firms were originally established to provide services to a small number of parent organizations and, through the 1971-1981 period, grew rapidly to the point where the owners' work represented less than one-half of their revenues.

One other form of ownership for computer service organizations is that of a provincially-owned organization. Manitoba, Newfoundland and British Columbia have or have had such firms. These organizations typically service government departments and agencies as well as competing in the private marketplace.

The Computer Services Industry offers three classes of service:

- computer processing using customer-provided application software;

- complete application processing, where both the application software and computing facilities are provided by the computer services firm; and

- customized application development services.

Most of the larger computer service firms offer all three services. Normally they offer the "complete application processing service" in those industries where they have particular experience or expertise.

The first of these services, computer processing using customer provided application programs, is the "computer utility" concept. This was a financially attractive alternative to acquiring an in-house computer during the 1971-1981 period because the cost of EDP equipment generally favoured sharing larger computers. Since 1981, costs have declined dramatically. This has been more pronounced with small computers than large computers although there has been a marked overall improvement in the cost of information technology. The result has been to make small to medium sized in-house computers more cost effective than a computer service bureau to process customer provided applications.

This trend has led to a shift of emphasis to the second and third classes of service described above. Computer services firms have also branched out into facilities management, distribution of application software and microcomputers, and network services in order to preserve revenues. The capitalization of computer services firms is also affected by the increasingly shorter technical lifespan of a manufacturer's product line. Rather than being current for five years, as was the practice in the early 1970's, today's computer is only "state of the art" for less than four years. This has forced changes in pricing and has penalized the computer services option by making the in-house option financially attractive.

Purchasing practices in the industry vary between the public and private sectors. Public sector purchases are frequently by tender with a strong emphasis on price. Private sector business is more often based on the business relationship established between the supplier and the consumer. Computer equipment leases tend to be for two to four year periods. Rental is on a monthly basis after a minimum period, usually of one year. Contracts for computer processing follow practices for EDP equipment or lease in terms of contract period and procurement approach. Contracts for customized application development tend to be by project.

The Computer Services Industry is characterized by a few, large, general purpose service organizations and many small firms. The small firms tend to provide complete application processing and customized application development of very limited scope, usually based on the expertise of the founders. Many such firms are successful in finding market niches in a particular industry.

There is limited penetration of the Computer Services Industry by United States based firms. When this does occur, it is usually for complete applications processing. User concerns over government intervention in cross-border data flow and the

complication of keeping basic business records outside the country usually limit the attractiveness of this source of services.

Computer services firms, if they are small, face relatively few barriers to entry especially if they can establish themselves in a market niche. Large computer services firms are unlikely to be created with the current decline in market attractiveness and continuing decrease in the cost of information technology.

The large computer services firms are concentrated in large population centres. Smaller, specialized firms are spread throughout urban areas. EDP equipment rental and lease firms tend to operate across the country, principally in urban areas with concentration depending on the size of the firm.

Current trends indicate that, in the future, there will be fewer firms offering EDP equipment for rental or lease. Shrinkage will continue to occur in market segments where suppliers do not offer complete systems. Manufacturers of IBM-compatible peripheral equipment and central processors will continue to struggle for survival. In the Computer Services Industry small specialty firms will prosper if they can secure market niches and exploit them while larger, shared processing firms will find markets increasingly difficult to maintain in the face of overcapacity and more attractive alternatives. It is expected that custom application development firms will increase in number and those that acquire expertise in using the new fourth generation language technologies should be successful. Demand for their services should remain strong as the market accepts that application development can be completed more efficiently and effectively.

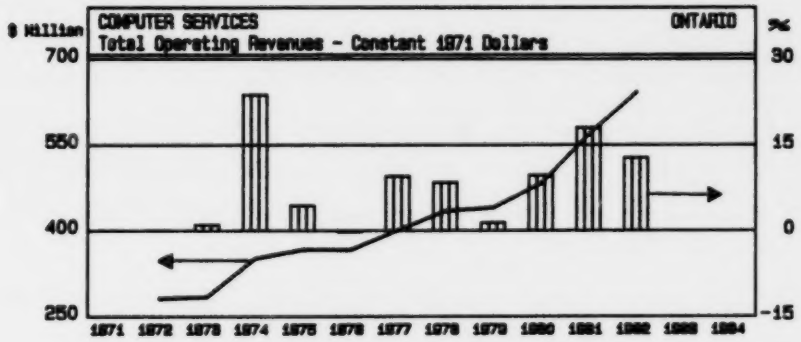
In summary, the market environment for leasing and renting EDP equipment and for computer services is growing but there is significant restructuring occurring on the supply side of both of these markets.

2.3 Industry Trends

Tables D.1 to D.7 present key indicators for the years 1971 to 1984. These tables are contained in Appendix D.

2.3.1 Aggregate Output

EXHIBIT 1



In 1972, the combined total operating revenues of firms providing computer services and those which primarily engaged in the lease and rental of EDP equipment, in Ontario, was $294.2 million, in current dollars. This increased to $1,766.6 million in 1982, an average annual growth rate of 19.6 percent over the period (see Table D.3).

In 1971 constant dollar terms, 1972 total revenues were $280.2 million, growing to $641.2 million in 1982. This shows a real average annual growth rate of 8.6 percent.

Though firms primarily engaged in computer services were far more numerous than those classified under renting and leasing EDP equipment, they only accounted for approximately one-third of total revenues. The revenue per firm was over 30 times greater in EDP equipment renting and leasing than in computer services.

Between 1973 and 1974, total revenues in computer services as a whole experienced a sharp increase of 23.7 percent in real terms. Activity was somewhat subdued in the next couple of years, while the economy recovered from the 1975 recession. From 1977 onward, the Computer Services Industry grew at a steady pace of between 8.5 to 18.0 percent per year. Those firms providing primarily computer services increased their share of total operating revenue to over 42 percent by 1982. Even the harsh economic downturn of 1981/1982 did not dampen growth in this industry.

2.3.2 Competitive Position

Over 96 percent of all firms indicated they were more than 51 percent Canadian-owned in 1982. Since 1979, Canadian-owned firms have accounted for 80 percent of the revenue in the service bureau and professional services segment. The situation is very different in the software products area where the bulk of the systems and applications software packages used in Ontario are produced by foreign (mainly U.S.) suppliers.

Data on renting and leasing firms is limited and is only published at the Canada level, because of the small number of firms involved. Therefore, no comparisons have been made between Ontario and Canada.

This analysis of competitive position is limited to those firms involved mainly in computer services. Even so, no reliable estimates of service imports are available, but the widespread perception is that there is a rapidly increasing balance of trade deficit. Export data is limited to revenues generated outside of Canada as opposed to outside of Ontario.

Revenue generated outside of Canada by Ontario-based computer service firms, accounted for less than 8 percent of total operating revenues in 1982. The highest level of offshore revenue was reached in 1981, when $81.4 million or 12.6 percent of total operating revenue was generated outside of the country.

It should be noted that, in both components of the Computer Services Industry (service companies and lease/rental firms), revenue per employee has been rising steadily over the last few years (see Table D.4). Between 1978 and 1982, average revenue per employee has had a compound annual growth rate of 16.5 percent for lease/rental firms and 9.8 percent for service oriented companies. These gains in productivity can be attributed to the application of new technology.

Both equipment and service suppliers operate in a competitive North American and world market. This is particularly true of computer hardware, packaged software, and some types of information retrieval services, where demands of Canadian users are similar to those of users in the United States. This industry is both dynamic and essentially unregulated, at least in North America. Factors such as equipment cost differential, access to venture capital, the tax treatment of software development and related activities tend to affect the competitiveness of Canadian firms in the North American market. This, in turn, affects their opportunities for profitable growth and job creation.

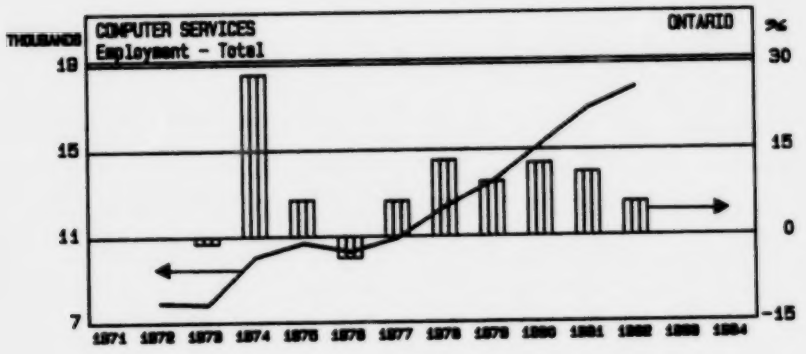
2.3.3 Employment

The discussion of employment includes an analysis of aggregate trends and occupational changes.

- Aggregate Trends

In this report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Computer Service Industry, Cat. No. 53-622. This data series is based on the census of firms conducted by Statistics Canada annually. This data is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

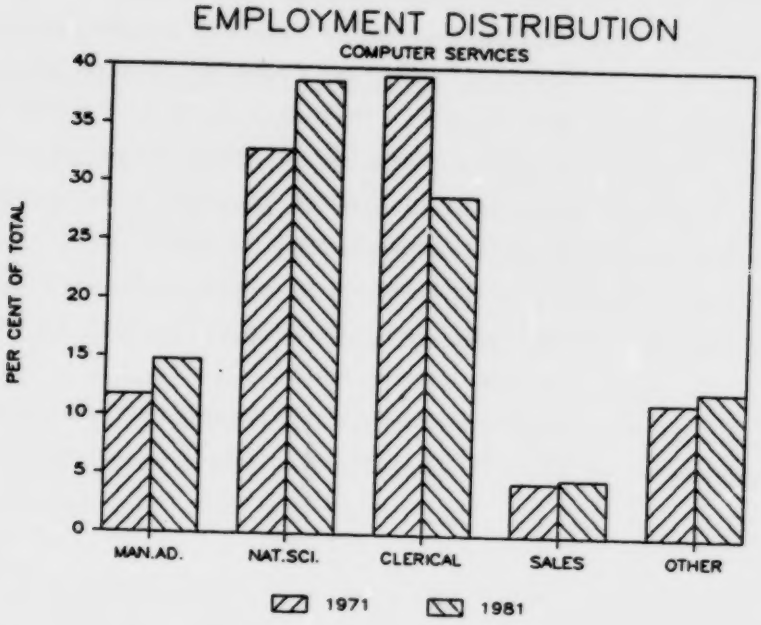
EXHIBIT 2



Total employment in the Computer Services Industry, in Ontario increased from 7,900 in 1972 to 17,854 employees in 1982, an average annual growth rate of 8.5 percent (see Table D.5). Employment levels in firms engaged primarily in the leasing and renting of equipment remained steady, averaging about 5,100 employees. Employment in the service-oriented firms increased one and a half times from 1974 levels, growing to 12,318 employees in 1982.

- Occupational Changes

EXHIBIT 3



Census data for Ontario, presented in Table D.6, shows that total employment increased at an average annual rate of 23.2 percent between 1971 and 1981. The only broad occupational group to show a growth rate less than that of the total industry was Clerical and Related workers, which still showed a respectable 19.5 percent average annual growth rate. The largest broad occupational group is Natural Sciences, Engineering and Mathematics. Employment in this group experienced an average annual rate of growth of 25.2 percent between 1971 and 1981. This increased the group's proportion of total industry employment from 32.9 percent in 1971 to 38.8 percent in 1981.

Management, Administrative and Related occupations made up the third largest occupational group and accounted for 14.8 percent of employment in the industry in 1981. The growth rate for employment in

this occupational group also exceeded the industry average, increasing at an average annual rate of 26.1 percent between 1971 and 1981. The smallest occupational group was Sales, which accounted for only 4.9 percent of employment in 1981, but exhibited a strong growth rate of 24.0 percent over the decade.

An analysis at the more detailed occupational level in the Clerical and Related group shows employment growing fastest for bookkeepers and accounting clerks at an average annual rate of 24.8 percent. This is also one of the smaller occupational categories representing 11.3 percent of Clerical and Related workers in 1981. The largest occupational category in this group is electronic data-processing equipment operators, which accounted for 46.1 percent of all Clerical and Related workers in 1981. Employment grew at an average annual rate of 20.1 percent between 1971 and 1981 in this category.

One of the smaller occupational categories in the industry, having the overall highest growth rate was technical salesmen and related advisors. This category experienced an average annual growth rate of 38.9 percent.

Within the other major occupational group - Natural Sciences, Engineering and Mathematics - the highest average annual growth rate was experienced by architectural and engineering technologists and technicians (31.1 percent). The largest occupational category was systems analysts, computer programmers and related, which accounted for over 82 percent of

total employment in the Natural Sciences, Engineering and Mathematical occupations. The average annual growth rate in employment in this category was 25.1 percent over the ten year period.

The analysis by sex, in Table D.7, indicates that the total number of females employed in the Computer Services Industry declined slightly, from 36.2 percent in 1971 to 35.0 percent in 1981. In the broad occupational groups, the only group where the percentage of females employed declined was in Clerical and Related occupations. In 1971, females accounted for 74.4 percent of this group, while in 1981 this decreased to 70.8 percent. The same was true of all the more detailed occupational categories, except that of supervisors, which increased, and general office clerks and secretaries, which stayed constant.

In all other major occupational groups, the percentage of females employed increased dramatically. In 1971, the percentage of females employed in Sales, Managerial, Administrative and Related, and Natural Sciences, Engineering and Mathematics was 5.3 percent, 8.2 percent and 10.9 percent respectively. In 1981, the proportions increased to 23.3 percent, 25.8 percent and 19.5 percent for the same occupational groups. Clerical and Related categories gained more jobs for females (2,840) than the other three groups combined (2,000).

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of the study presents the survey results which discuss the firms' surveyed opinions with regard to future trends in technological adoption and in employment.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Computer Services Industry and the factors driving the need and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

Table 2 summarizes survey responses regarding the adoption of technologies before 1985 and firms' plans for adoption or adding technologies in the next five years and in the period of 1990-1995.

3.1.1 Service Delivery Technologies

- Installed customized software systems are currently used by 50 percent of firms and 40 percent employ customized hardware systems.

- On-line client access to data bases and interactive systems with clients is used by half the firms now, with the remaining firms planning concentrated adoption by 1990.

Results of Question 3

TABLE 2: COMPUTER SERVICES

SIC 853

Percent of Firms Planning to Adopt New Technologies (1)

Technologies	Before 1985 Total	1985-1990 Total	1990-1995 Total
SERVICE DELIVERY TECHNOLOGIES			
Custom Software Systems	80	20	-
Custom Hardware Systems	40	60	-
Client Access to Data Bases	50	50	25
Interactive System Clients	60	60	20
Video Conferencing	25	-	25
Other	0	20	0
DESIGN TECHNOLOGIES			
Computer Aided Design (CAD)	0	20	-
Computer Aided Engineering (CAE)	0	20	-
4th Generation Computer Languages	40	60	-
OFFICE AUTOMATION TECHNOLOGIES			
Mainframe/Minicomputers	80	20	-
Word Processing	100	-	-
Electronic Filing	20	40	20
Microcomputers/Personal Computers	80	20	-
Internal Data Base Management Systems	60	-	-
Local Area Networks (LANs)	60	20	-
Voice Activated Computers	0	60	-
Artificial Intelligence/Expert Systems	0	40	-
Integrated Work Stations	0	60	-
Data Base Services	60	20	-
Home Terminals	0	40	-
TELECOMMUNICATIONS TECHNOLOGIES			
Private Automatic Branch Exchange (PABX)	60	-	20
Electronic Mail	20	60	20
Facsimile with Built-In Microprocessor (FAX)	20	20	20
Satellite/Microwave Systems	0	-	40
Videotex	0	-	40
Fibre Optics	0	-	20

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for period 1985-1990 a 1990-1995 to indicate respondents, at the time of survey, are not planning to adopt this technology or 'don't know'. Responses are not mutually exclusive.

3.1.2 Design Technologies

- None of the firms surveyed presently use computer aided engineering (CAE), or computer aided design (CAD) and plans for future adoption are minimal.

- Less than half of the firms have adopted fourth generation computer languages and the remaining firms plan to introduce them within the next five years.

3.1.3 Office Automation Technologies

- Computers are widely used in the industry (80%) and all of the firms expect to use them by 1990.

- All firms have invested in word processing systems.

- Electronic filing has made limited inroads but further purchases are anticipated in the next ten years.

- Internal data base management systems are currently used by 60 percent of the industry participants surveyed with no further adoption planned.

- Local area networks (LANs) are used by 60 percent of firms and additional use is anticipated by 1990.

- None of the firms surveyed have invested in voice activated computers, artificial intelligence/expert systems, and integrated work stations, but investment is planned in the next five years.

Results of Question 4

TABLE 3: COMPUTER SERVICES

SIC 853

Most Important Factors Driving Need to Adopt New Technologies

Factor		Percent of Firms Total Firms
CUSTOMER DEMANDS FOR CHANGES	First	40
	Second	0
	Third	0
	Weighted Importance (1)	1.2
INCREASE PROFITABILITY	First	0
	Second	0
	Third	20
	Weighted Importance	0.2
LOWER COSTS	First	0
	Second	60
	Third	0
	Weighted Importance	1.2
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	20
	Second	0
	Third	0
	Weighted Importance	0.6
ENTER NEW MARKETS/ GROWTH	First	20
	Second	0
	Third	20
	Weighted Importance	0.8
OBSOLESCENCE	First	0
	Second	20
	Third	0
	Weighted Importance	0.4
ALL OTHERS	First	20
	Second	20
	Third	0
	Weighted Importance	1.0

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

3.1.4 Telecommunications Technologies

- Respondents report relatively few purchases of telecommunication technologies. At present, private automatic branch exchange (PABX), fibre optics, satellite/microwave and videotex systems are not used at all. However, in the next 10 years, 20 to 40 percent of the firms surveyed will begin to implement these technologies.

- Only 20 percent of reporting firms are presently using electronic mail but incorporation is anticipated in the near future.

- Minimal adoption of FAX systems is anticipated for the next ten years.

3.2 Forces Driving the Need to Adopt New Technology

Three main forces are influencing the surveyed firms in decisions to adopt new technology. Table 3 summarizes the responses. The factors, which are ranked according to weighted importance are:

- Customer demands for changes (40 percent ranked this first).

- Lower costs (more than half of the firms ranked this of secondary importance).

- Enter new markets/growth.

Respondents indicate that it is necessary, in a competitive environment, to offer "state of the art" technology to clients, and that "inhouse" development costs are often lower than going to an external source. If both of these factors can be accomplished successfully, this then increases their ability to enter new markets and ensure continued growth.

Results of Question 5

TABLE 4: COMPUTER SERVICES SIC 853

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms: Total Firms
ABILITY TO FINANCE	First	40
	Second	0
	Third (1)	0
	Weighted Importance	1.2
COST OF NEW TECHNOLOGY	First	40
	Second	0
	Third	0
	Weighted Importance	1.2
LACK OF GOVERNMENT ASSISTANCE	First	20
	Second	0
	Third	0
	Weighted Importance	0.6
COMPETITIVE ENVIRONMENT	First	0
	Second	0
	Third	20
	Weighted Importance	0.2
POOR ECONOMIC CONDITIONS	First	0
	Second	20
	Third	20
	Weighted Importance	0.6
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	0
	Second	60
	Third	0
	Weighted Importance	1.2
UNWILLINGNESS TO CHANGE	First	0
	Second	0
	Third	20
	Weighted Importance	0.2

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

3.3 Factors that Could Slow the Rate of Technology Adoption

The factors that tend to slow the rate at which the Computer Services Industry adopts new technology are summarized in Table 4. The most important factors for all reporting firms are:

- Cost of technology and the ability to finance,
- Lack of skills and/or know-how to implement, and
- Poor economic conditions and lack of government assistance.

Some firms suggested that the cost of implementing and tailoring new technology to their needs in conjunction with a lack of funds is a drawback. Moreover, where a "tight" economy exists, and where there is little market demand combined with small profit margins, the rate of technological adoption is limited.

In summary, firms in the Computer Services Industry have adopted a large amount of office automation technology to date. Although telecommunications technology has not historically been aggressively adopted, by 1995, many of the firms surveyed will be using some form of this technology. The main reasons why firms adopt these technologies are, to meet changing consumer demand and to lower costs in order to ensure long term growth. At the same time however, these firms are concerned with the cost of new technology and poor economic conditions. Moreover, they feel inhibited by an inability to finance new technology and meet the changing skill requirements involved.

Results of Question 1

TABLE 5: COMPUTER SERVICES — SIC 853

Operating Revenues in Ontario

Average Annual Compound Rate of Change (in Constant Dollars) (1)

	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Total Firms	17.5	17.5	19.0	25.0	19.5

(1) Rounded to closest 0.5 %

4.0 INDUSTRY OUTLOOK TO 1995

This chapter reviews the anticipated outlook for the Computer Services Industry in terms of aggregate output (i.e., operating revenues in Ontario), investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Operating revenues in the Computer Services Industry averaged real (constant dollar) growth of 8.6 percent a year over the 1972 to 1982 period and 12.8 percent in 1982. The firms surveyed estimated a 17.5 percent average annual growth rate for both 1982 and 1983. The industry expects a 19.0 percent increase this year and projects increases of 25 percent a year during the period 1985 to 1990. A slowdown in the average annual growth rate to 19.5 percent is anticipated by industry participants in the 1990 to 1995 period (Table 5).

4.2 Investment Patterns

Capital investment in the Computer Services Industry in Ontario will be almost exclusively devoted to machinery and equipment expenditures, accounting for 90 percent of total investment in the coming decade and 70 to 90 percent of this investment will be related to new technology.

4.2.1 Justifying Financial Investment in New Technology

When considering investments in new technology, 67 percent of the firms surveyed use the pay-back period criteria. These firms expect to pay off new investment in four years. Return on investment is used by an equal percentage of firms in assessing investment decisions. A 20 percent return on investment is expected on average by responding firms. Table 6 presents the respondents replies.

Results of Question 17e

TABLE 6: COMPUTER SERVICES SIC 853

Justifying Financial Investment in New Technology

	Pay-Back Period		Return on Investment	
	% of Firms Using Pay-Back	Average Period (Years)	% of Firms Using ROI	Average Rate (%)
Total Firms	67	4	67	20

Answers not mutually exclusive.

Results of Question 17f

TABLE 7: COMPUTER SERVICES SIC 853

Source of Funds for New Technology Spending

	Internal Funds	External Funds
	Percent	Percent
Total Firms	75	25

SIC 853

TABLE 8: COMPUTER SERVICES

Results of Question 11a,b,c

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	0
	Second	20
	Third	0
	Weighted Importance (1)	0.4
INCREASE SALES/ INCREASE MARKET SHARE	First	80
	Second	0
	Third	20
	Weighted Importance	2.6
INTRODUCTION OF NEW TECHNOLOGY	First	0
	Second	20
	Third	0
	Weighted Importance	0.4
AVAILABILITY OF NECESSARY SKILLS	First	0
	Second	0
	Third	20
	Weighted Importance	0.2
INDUSTRY-WIDE GROWTH	First	0
	Second	20
	Third	0
	Weighted Importance	0.4
OVERALL ECONOMIC GROWTH	First	20
	Second	0
	Third	0
	Weighted Importance	0.6
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	0
	Second	20
	Third	0
	Weighted Importance	0.4

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 11d

TABLE 9: COMPUTER SERVICES SIC 853

Firms' Employment Trends in Ontario

	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated Rate		Expected Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Total Firms	13.5	20.0	21.5	12.5

(1) Rounded to closest 0.5%.

4.2.2 Source of New Capital Spending

The Computer Services Industry relies heavily on internal sources of funds to finance investment in new technologies (Table 7).

4.3 Employment to 1995

This section of the report reviews expected trends in employment patterns and outlines the most important factors affecting aggregate employment.

4.3.1 Factors Affecting Employment

When asked to identify the most important factors affecting the firm's employment level in Ontario respondents identified the following:

- Increase sales/increase market share (80 percent of respondents ranked this as most important), and
- Overall economic growth.

Other factors mentioned of equal weight but of less importance overall were:

- Profitability/financial strength,
- Introduction of new technology,
- Industry wide growth, and
- Foreign exchange rate/Canadian competitiveness.

Table 8 presents the firms' replies.

4.3.2 Employment Outlook

Total employment in the Computer Services Industry in Ontario grew at an average annual rate of 8.5 percent from

Results of Question 12

TABLE 10: COMPUTER SERVICES — SIC 853

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	16.9	16.3	15.1	14.4	13.0
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	36.3	34.6	37.1	49.9	58.1
• Engineers		n.a.	n.a.	n.a.	n.a.
• Engineering Technicians and Technologists		n.a.	n.a.	n.a.	n.a.
• Systems Analysts and Computer Programmers		0	+	+	+
CLERICAL	17.3	20.9	19.5	13.6	9.8
• Secretaries		+	0	-	-
• Typists/Clerk Typists (includes Word Processing Operators)		n.a.	n.a.	n.a.	n.a.
• Bookkeepers and Accounting Clerks		0	0	-	-
• EDP Equipment Operators		-	-	-	-
• General Office Clerks		-	-	-	-
• All Other Clerks		+	+	-	-
SALES	19.2	22.8	19.0	14.3	12.0
OTHER OCCUPATIONS	10.4	5.4	9.3	7.8	7.1
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease o no change
n.a. no answer

1971 to 1981. The survey findings shown in Table 9 suggest that employment increased at a rate of 13.5 percent from 1981-1984 and that there was a 20.0 percent estimated employment growth in 1984. In the next five years the growth rate is expected to average 21.5 percent a year with a slowdown anticipated for the 1990 to 1995 period, to 12.5 percent a year.

This strong growth/slower growth pattern is consistent with anticipated growth rates for operating revenues in the coming decade (see Table 5).

4.3.3 Trends in Part-time Work

Part-time work has to date not been a factor in the Computer Services Industry, accounting for 4.5 percent of total employment in 1981, 7.0 percent in 1984 and 6.0 percent in 1985. Over the next ten years the use of part-time workers is expected to decrease substantially to about 2 to 3 percent of total employment.

4.4 Changes in Occupational Structure

Table 10 shows expected trends in firms' occupational structure (i.e., percent of total industry employment by occupation), in the Computer Services Industry from 1981 to 1995. Trends over time for occupational subgroups are expressed as: +, increasing share of total employment; -, decreasing share of total employment; and o, no change in share of total employment. The 1971 Canadian Classification and Dictionary of Occupations was used to classify and describe the occupations outlined in Table 10. Survey respondents were provided with a detailed description of each occupation; however, in some cases, differences in interpretation of the classifications occurred, and the "Other Occupations" category therefore could include employees from other major occupational categories.

The survey shows shifts in the industry's work force as follows;

- A decline in the proportion of Managerial, Administrative and Related occupations over the forecast period.

- A decline in the Natural Sciences, Engineering and Mathematics occupations from 1981 to 1984, followed by a progressive increase from 1985 to 1995. Systems analysts and computer programmers are expected to contribute to this upward trend.

- An estimated increase in Clerical occupations from 1981 to 1984 followed by a marked falling off in employment share in the coming decade.

- A slight increase in Sales in the 1981 to 1984 period, followed by a decline during the forecast period.

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and the impact on skill levels and job content.

5.1 Effects on Occupations

Table 11 summarizes firms' expectations of technology's impact on occupational requirements. A rather high degree of 'no response' was forthcoming, which could be interpreted as 'don't know'. However, there were a few occupations where a majority of responses suggested a short supply is anticipated. The figures in brackets refer to the percentage of firms expecting the shortage:

- Managerial, administrative and related (80%),
- Systems analysts and computer programmers (80%),
- Sales (50%), and
- Other occupations (50%).

An oversupply could occur for bookkeepers and accounting clerks but the predominance of 'no responses' as mentioned above, clouds interpretation.

5.2 Likely Steps to Deal With Skills Oversupply

In dealing with a potential oversupply of skills by occupation, the most commonly cited steps are shown in Table 12 and summarized overleaf:

Results of Question 6

TABLE 11: COMPUTER SERVICES — SIC 853

Impact of Technology on Selected Occupations in Firms
1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	0	80	20
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	20	0	80
• Engineering Technicians and Technologists	40	0	60
• Systems Analysts and Computer Programmers	20	80	0
CLERICAL			
• Secretaries	0	20	80
• Typists/Clerk Typists (includes Word Processing Operators	20	0	80
• Bookkeepers and Accounting Clerks	60	0	40
• EDP Equipment Operators	40	0	60
• General Office Clerks	20	0	80
SALES	0	50	50
OTHER OCCUPATIONS	0	50	50

Results of Question 7

TABLE 12: COMPUTER SERVICES — SIC 853

Steps Firms Will Likely Take to Deal With OVERSUPPLY of Skills
1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	Attrition	Retrain	(1)
• Engineering Technicians and Technologists	Attrition	Retrain	(1)
• Systems Analysts and Computer Programmers	Transfer	Layoff	(1)
CLERICAL			
• Typists/Clerk Typists (includes Word Processing Operators)	Attrition	Retrain	(1)
• Bookkeepers and Accounting Clerks	Attrition	Layoff	Transfer
• EDP Equipment Operators	Attrition	Retrain	(1)
• General Office Clerks	Attrition	Retrain	(1)

(1) Only two steps mentioned.

Results of Question 8

TABLE 13: COMPUTER SERVICES SIC 853

Steps Firms Will Likely Take to Deal With SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Upgrade	Recruit	Retrain
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Systems Analysts and Computer Programmers	Recruit	Retrain	Upgrade
CLERICAL			
• Secretaries	Upgrade	Recruit	(1)
SALES	Upgrade	Recruit	Retrain
OTHER OCCUPATIONS	Retrain	Upgrade	Recruit

(1) Only two steps mentioned.

Response	Most Common	Second Most Common	Third Most Common
Attrition	6		
Retraining		5	
Lateral/Transfer	1		1
Layoffs		2	

The clear preference for dealing with an oversupply is by attrition or by retraining. Layoffs are viewed as a least likely solution.

5.3 Likely Steps to Deal With Skills Shortages

In dealing with anticipated skills shortages, the most commonly cited responses are shown in Table 13 and summarized below.

Response	Most Common	Second Most Common	Third Most Common
Upgrade	3	1	1
Recruit	1	3	1
Retraining	1	1	2

Table 13 suggests that the preferred method to deal with skill shortages will be to upgrade. Recruiting and retraining rank second and third respectively.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to rank the impact of new technologies on selected occupations for:

- skills required,
- time to achieve proficiency, and
- knowledge of their firm's operations.

Results of Question 9

TABLE 14: COMPUTER SERVICES — SIC 853

Impact of Technology on Skill Levels and Job Content

(1) Percent of Firms

Occupations	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	100	0	0	50	0	50	75	0	25
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	100	0	0	100	0	0	0	0	100
• Engineering Technicians and Technologists	0	0	100	0	0	100	0	0	100
• Systems Analysts and Computer Programmers	75	0	25	75	0	25	100	0	0
CLERICAL									
• Secretaries	67	0	33	33	67	0	67	33	0
• Typists/Clerk Typists (includes Word Processing Operators)	100	0	0	67	0	33	33	33	33
• Bookkeepers and Accounting Clerks	25	25	50	25	25	50	0	33	67
• EDP Equipment Operators	50	50	0	0	50	50	50	50	0
• General Office Clerks	0	100	0	0	100	0	0	100	0
SALES	50	0	50	50	0	50	100	0	0
OTHER OCCUPATIONS	100	0	0	100	0	0	100	0	0

+ increase - decrease 0 remain the same

(1) Non-responses excluded.

The results are summarized in Table 14. Respondents expect the skill levels required to rise in all occupations except in engineering technicians and technologists, bookkeepers and accounting clerks and general office clerks. All firms surveyed expect skill levels required to decrease for general office clerks.

The effect of new technology introduction on time required to achieve proficiency depends on occupation. An increase in time required is anticipated for the following:

- engineers (100%),
- systems analysts/computer programmers (75%), and
- typists/clerk typists (67%).

Secretaries and general office clerks are expected to require less time, and engineering technicians and technologists will require about the same. Response is mixed for Sales and Managerial occupations, anticipated to require more or about the same amount of time to achieve proficiency.

Firms clearly expect their employees to become better informed about company operations if they are to make proper use of the new technology being introduced. This is particularly so for the following occupations:

- Managerial occupations (75%),
- Systems analysts/computer programmers (100%),
- Secretaries (67%), and
- Sales occupations.

Less knowledge is anticipated for general office clerks and no change in required knowledge is expected for engineers and bookkeepers and accounting clerks. The views were equally split between more and less time for EDP equipment operators.

5.5 Training Costs and New Technology

Computer services firms estimate that they currently spend 12.5 percent of total labour costs on training. This amount is expected to decrease to 10 percent per year by 1990 and then stabilize for the next five years.

Firms estimate that about 53 percent of their training costs are related to new technology and anticipate an increase to a rate of 57 percent for the forecast period.

6.0 LABOUR RELATIONS ENVIRONMENT

There is no indication of any union activity historically or at present within this industry as referenced by the Ontario Ministry of Labour.

6.1 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality, and adopting new technology. The following summarizes the survey results:

- 50 percent of the firms have mechanisms for worker participation at the department/area level, 40 percent at the working group level, 33 percent at the division/plant level, and only 25 percent at the company level.

- 60 percent have mechanisms for discussion with regard to improving productivity/quality, and

- 60 percent have a mechanism for employee participation in the adoption of new technology.

6.2 Views on Involving Workers in Decisions on Adopting New Technology

Management was also asked to what extent and how should they involve workers in decisions regarding the adoption of new technology. Firms were divided in their views on the extent of involvement. Approximately 50 percent of firms favour implementing training programs while 25 percent of firms surveyed favour involving workers in each of the following categories: full involvement, prior consultation, advance notice and discussion (limited dialogue).

In summary, no firms in the Computer Services Industry to date are unionized. More than half of the reporting firms have mechanisms for worker involvement in adopting new technology and for worker involvement on issues dealing with productivity or quality. Approximately 50 percent of firms favour implementation of training programs but only 25 percent favour full involvement or any kind of discussion or consultation in decisions regarding adoption of new technology.

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports on the survey results regarding questions related to planning for technological change. A summary appears in Table 15.

The respondents indicate that only 40 percent of the industry makes use of strategic planning. 40 percent of firms make use of human resources planning which, in relative terms, is better established than capital investment planning for new technology, with only 20 percent of firms involved. The firm's average planning horizon is 4 to 5 years which is approximately the same as their anticipated pay-back period of 4 years for new machinery and equipment.

On average, these plans are well integrated.

TABLE 15: COMPUTER SERVICES

SIC 853

Results of Question 18

Planning for Technological Change

	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Total Firms	40	40	4 years	20	5 years	5.0

(1) Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

SECTION II - OFFICES OF MANAGEMENT CONSULTING

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of the Management Consulting Industry trends for the period 1971 to 1981 and 1982 to 1984.

Offices of business and management consultants, SIC 867, includes actuarial, business, customs and personnel management consultants as well as consulting economists, customs tariff specialists, efficiency experts, management consulting services, and public relations counsellors.

Information on this diverse group of specialists is difficult to obtain. No Statistics Canada data is available and information contained in this report has been compiled from trade and professional association sources. As a result, data for several important categories is missing, including total aggregate output, total employment and capital investment. In addition, not all of the above specialities are represented by professional associations. Therefore, no data are included on customs tariff specialists, customs consultants and efficiency experts, unless they are employed by one of the large multi-disciplinary management consulting firms in the province.

There are also problems in distinguishing between this SIC category and SIC 853, Computer Services, as they overlap in one significant area. Most management consulting firms in Ontario offer data processing consulting services, an activity which is classified as a major component of SIC 853. For the purposes of this report, revenue from data processing consulting services has been omitted from calculations of total output of the business and management consulting sector. It was not possible to separate, in the same

fashion, the numbers of consultants involved in providing data processing services from the total employment data. It is therefore likely that there is some double counting in employment data between SIC 867 and SIC 853.

Despite these drawbacks, trend information on the growth of the industry in Ontario has been compiled, and, by making several assumptions, an estimate of the total size and employment in the industry has been made.

2.1 The Market Environment

Most firms in the business and management consulting industry are Canadian-owned partnerships. There are a few large and well-known subsidiaries of United States and United Kingdom based organizations but, even in these cases, there is usually a substantial Canadian ownership by the partners based in, and working out of this country.

Barriers to entry into the industry are few, hence there are very many small one-and two-person operations offering consulting services. Despite this, it is estimated that approximately 65 to 70 percent of the revenues from the management consulting service segment of the industry is earned by the largest 20 firms.

All the major firms operate across the country and typically Ontario represents about 40 to 50 percent of the total Canadian market. The so-called "big eight" accounting firms all offer consulting services, either as an integral part of the accounting/auditing practice or as an associated firm.

Competition from offshore is limited. Purchasing practices in the public sector favour a high Canadian component and limit the penetration of large United States firms. This is not so noticeable in the private sector, and a few, large, United States-based consulting firms work for major Canadian manufacturers, financial institutions and communications companies.

There is little direct competition from other countries. The high cost of travel and accommodation limits this to a small percentage of total industry revenues. Industry exports typically centre around expertise which has been developed by Canadian consultants in the resource industries, such as mining and forestry. Other exports focus on providing aid to Third World countries and NICs (Newly Industrialized Countries), work which is often sponsored by national and international agencies such as the World Bank and CIDA.

Financial services, operations and production consulting, and government consulting services are generally dominated by audit related firms. United States firms, such as McKinsey and the Boston Consulting Group, play a large role in general management, strategy and organization work. Marketing services are provided by both advertising firms and market research specialists. Human resource management consulting services, including executive search, are provided by both audit-related firms and specialists.

The dynamics of the industry have changed over the last decade. At the beginning of the 1970's, large, multi-disciplinary firms tended to dominate the marketplace. The early to mid 1970's saw the emergence of specialty houses or "boutiques" which began to take market share away from "department store" firms. This trend is reversing itself in the early part of the 1980's as the economics of the practice change and as smaller specialized firms struggle to overcome the effects of the recession. Several recent acquisitions/mergers have occurred, including the merger of Stevenson and Kellogg with Thorne Ridell in 1980 and the acquisition of Hickling Johnson by William Mercer in 1983.

Emerging trends which will shape the industry in the 1980's are as follows.

- An increasing emphasis on specialization. More complex client problems are leading to the use of specialist teams

who bring together the right combination of functional, industry, and, in some cases, regional expertise.

- A continuing shake-out of consulting firms. It is generally agreed that over the coming five years, many firms will not survive, but that those which do will grow in terms of profitabilty and size. Successful firms will be small firms who possess a unique set of specialized skills or large firms who can combine strategic strength with technical capabilities and proven problem solving ability.

- Clients are emphasizing practical industry experience when awarding contracts. As a result, consulting firms are careful in their use of young MBA trained resources and are using them along with more senior experienced professionals. This, in turn, puts profit pressure on consulting firms as the opportunity for leverage is reduced.

- Firms tend now to be organized by function or industry specialization rather than along geographic lines. Most large firms now operate national talent pools and expect staff to be mobile.

2.2 Industry Trends

Due to the lack of published data the following paragraphs explain the sources used and assumptions made to construct an historical data base. Tables D.8 to D.10 in Appendix D presents the historical trends.

2.2.1 Aggregate Output

Aggregate output (revenue) is available only for the management consulting services segment of the industry.

The Canadian Association of Management Consultants (CAMC) has collected and analysed information on revenues and employment of member firms since the mid 1960's. It is estimated that this data represents approximately 65 percent of all management consulting carried out in Ontario.

No equivalent source of information is available on actuarial consulting, economic consulting and firms involved in providing public relations services. In these cases, employment in Ontario has been determined through information supplied by the corresponding professional associations. The Canadian Institute of Actuaries, the Canadian Public Relations Society and the Canadian Association of Business Economists have provided numbers of members who are consultants and who operate in Ontario. These figures represent professionals only and do not include administrative, support and other associated staff.

No information is included on customs consultants, customs tariff specialists and efficiency experts.

EXHIBIT 4

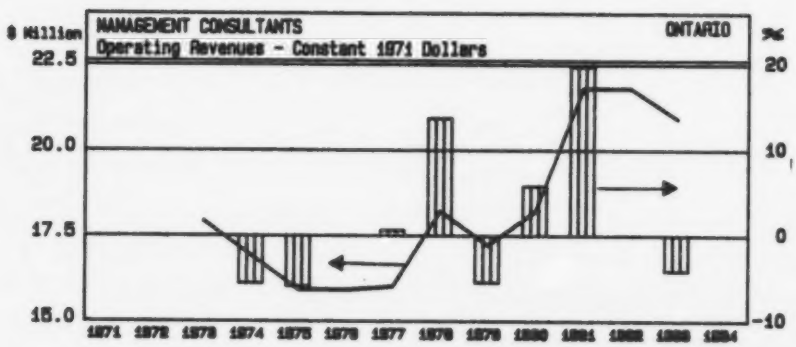
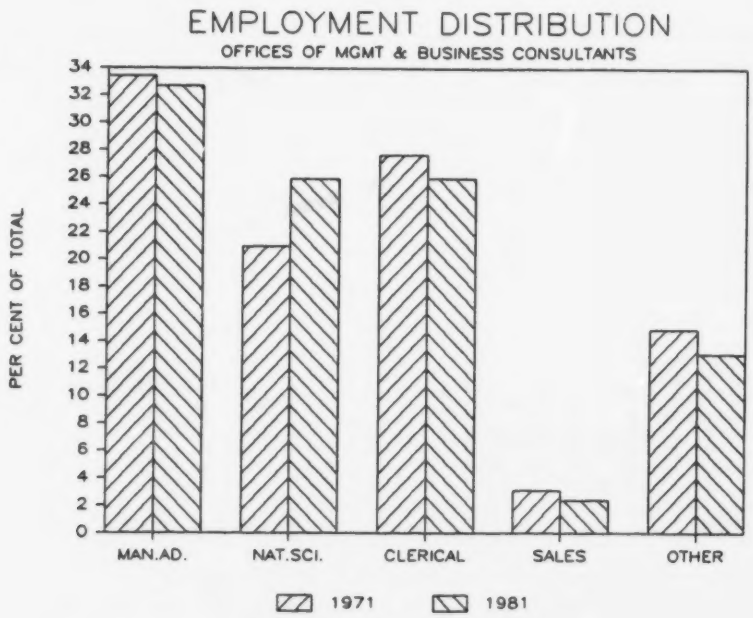


Table D.8, indicates the total aggregate output of the management consulting segment for the period 1973 to 1983. The figures represent an estimate of total Ontario output arrived at by taking actual data as reported by the CAMC members, deducting revenues resulting from data processing consulting and grossing the result up to 100 percent from an estimated 65 percent.

The information indicates that the growth of the consulting industry has averaged 2.2 percent in real terms over the period 1973 to 1982. The market then declined by 4.1 percent in 1983. Preliminary estimates indicate that the industry will show some growth in 1984.

2.2.2 Employment

EXHIBIT 5



According to the census data presented in Table D.9, employment in management and business consulting in Ontario has been growing at an average annual rate of 17.2 percent between 1971 and 1981. In 1981, there were 10,975 employees in this industry in Ontario. There appears to

be a contradiction between the 2.2 percent annual growth in activity levels and the 17.2 percent annual employment growth. However, it must be noted that the first relates to large firms and the latter employment data to total employment according to the census which includes all operations including small "boutiques" and single consultants.

At the broad occupational level the fastest growing occupational group was Natural Sciences, Engineering and Mathematics, with an average annual growth rate of 19.7 from 1971 to 1981. This group also accounted for 25.9 percent of total employment in 1981. The largest occupational group was Managerial, Administrative and Related with 3,590 employees in 1981. This group experienced an average annual growth rate of 17.0 percent from 1971 to 1981. Clerical and Related occupations accounted for the bulk of the remaining employees - 25.9 percent of total employment in 1981. This group experienced an average annual growth rate of 15.4 over the decade, growing less rapidly than the industry in general. The smallest group, with only 260 employees in 1981, was Sales. This group also had the lowest average annual growth of 14.0 percent from 1971 to 1981.

At the more detailed occupational level, within the Natural Sciences, Engineering and Mathematics group, systems analysts, computer programmers and related occupations experienced the highest growth rate of 32.9 percent from 1971 to 1981. This category had 515 employees in 1981. The largest category was industrial engineers with 39.2 percent of employees in this field. This category experienced an average annual growth rate of 16.6 percent from 1971 to 1981. Civil engineers and draughtsmen were the two smallest categories with lower average growth rates of 3.4 percent and 11.1 percent per annum respectively from 1971 to 1981.

Occupations, n.e.c., at the more detailed occupational level, was the largest category in the Managerial, Administrative and Related group with 1,485 employees in 1981 and an average annual growth rate of 17.2 percent from 1971 to 1981. Sales and advertising management was the smallest occupational category but had the highest overall average annual growth rate of 36.2 percent over the ten year period.

In the Clerical and Related group, the only two categories that experienced average annual increases of less than the industry average were typists and clerk-typists, (9.2 percent) and secretaries and stenographers, (12.8 percent). These two categories comprised 38.0 percent of employment in this area in 1981. Employment increased most rapidly for bookkeepers and accounting clerks at 26.8 percent per annum from 1971 to 1981. This category accounted for 28.3 percent of Clerical occupations in 1981.

Table D.10 indicates that women had a strong presence in this industry, accounting for 44.7 percent of all jobs in 1981. This is an improvement of 10.6 percent (or an increase of 4,145 new jobs) from the 1971 level. Over half the women in management and business consulting were found in Clerical and Related jobs, where women accounted for 91.7 percent of workers in 1981.

The second area of strength for women was Managerial, Administrative and Related positions, where 1,235 women accounted for over one-third of the jobs in this group in 1981. This was also an area where women increased their representation significantly from the 1971 level of 12.7 percent.

Women were least represented in Natural Sciences, Engineering and Mathematics, though they did improve their proportion of total employment in this group from 7.4 in 1971 to 16.2 in 1981. In Sales, although women represented almost one-third of employment, the whole group only accounted for 85 jobs for females in 1981.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this report presents survey results which discuss the firms' surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Management and Business Consulting Industry and the factors affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

The offices of Management and Business Consulting Industry is affected by design, office automation and telecommunications technologies, as these technologies will increasingly have a major impact on their operations.

Table 16 summarizes the percentage of firms who adopted new technologies before 1985 and their plans for using these technologies during the next ten years.

The respondents indicated the following trends in technology adoption:

- In the next ten years medium size firms have plans to increase the adoption of new technologies. However in relative terms, small firms will be more aggressive in their adoption of new technologies versus medium sized firms.

3.1.1 Service Delivery Technologies

- Customized software and customized hardware systems are currently being used by 85 percent and 50 percent of firms respectively. Further use is planned over

Results of Question 3

TABLE 16: MANAGEMENT AND BUSINESS CONSULTANTS

SIC 867

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985			1985-1990			1990-1995		
	Small	Medium	Total	Small	Medium	Total	Small	Medium	Total
SERVICE DELIVERY TECHNOLOGIES									
Adopted Custom Software	83	100	85	67	50	65	17	-	15
Adopted Custom Hardware	50	50	50	50	50	50	17	-	15
Client Access to Data Bases	20	0	18	20	50	23	60	50	59
Interactive System with Clients	17	0	15	17	50	19	50	50	50
Video Conferencing	17	0	15	50	-	46	17	100	23
DESIGN TECHNOLOGIES									
Computer-Aided Design (CAD)	17	0	15	17	-	15	17	-	15
Computer-Aided Engineering (CAE)	17	0	15	17	-	15	17	-	15
4th Generation Computer Languages	17	0	15	67	50	65	17	-	15
OFFICE OR OFFICE AUTOMATION TECHNOLOGIES									
Mainframe/Minicomputers	100	50	96	33	50	35	17	-	15
Word Processing	83	100	85	50	-	46	17	-	15
Electronic Filing	17	0	15	50	50	50	-	-	-
Microcomputers/Personal Computers	67	100	69	33	-	31	17	-	15
Internal Data Base Management Systems	50	0	46	67	100	69	-	-	-
Local Area Networks (LANs)	17	0	15	50	50	50	-	-	-
Voice Activated Computers	17	0	15	17	-	15	17	-	15
Artificial Intelligence/Expert Systems	17	0	15	17	-	15	17	-	15
Integrated Work Stations	17	0	15	50	50	50	-	-	-
Data Base Services	67	100	69	17	-	15	-	-	-
Home Terminals	33	0	31	17	50	19	-	-	-
Others	17	50	19	-	-	-	-	-	-
TELECOMMUNICATIONS TECHNOLOGIES									
Private Automatic Branch Exchange (PABX)	33	100	39	50	0	46	-	-	-
Electronic Mail	50	0	46	67	50	65	17	50	19
Facsimile with Built-In Microprocessor (FAX)	33	100	39	33	-	31	17	-	15
Satellite/Microwave Systems	17	50	19	17	-	15	17	-	15
Videotex	17	0	15	33	-	31	-	-	-
Fibre Optics	17	0	15	17	-	15	17	-	15

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for period 1985-1990 and 1990-1995 to indicate respondents, at the time of survey, are not planning to adopt this technology or 'don't know'. Responses are not mutually exclusive.

the coming decade, concentrated mainly in the near term by small firms.

- Only small firms presently use on-line systems, and anticipate further large purchases, particularly in the 1990 to 1995 period, by which time the medium sized firms plan to catch up.

- Small firms again lead in the adoption of video conferencing, while the medium firms are waiting until the 1990's for this expenditure.

3.1.2 Design Technologies

- There is little current use of computer-aided design (CAD) or engineering (CAE) and the medium firms have made no plans to use these systems.

- 4th generation computer languages are present in only the small firms and further adoption is planned for the decade ahead. Some medium firms foresee adopting them in the near term.

3.1.3 Office Automation Technologies

- Mainframe/minicomputers and word processing are now available in most firms and further additions are planned through to 1995.

- No medium firms presently have internal base management systems but all medium firms expect to have them in the next five years.

- Some small firms only have local area networks (LANs), integrated work stations and have terminals, but half of the medium sized firms expect to use them by 1990.

Results of Question 4

TABLE 17: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Most Important Factors Driving Need to Adopt New Technologies

Factor		Percent of Firms by Employment Size: Small (20-199)	Medium (200-999)	Total Firms
COMPETITIVE PRESSURES	First	33	0	31
	Second	33	0	31
	Third	17	0	15
	Weighted Importance (1)	1.8	0.0	1.7
CUSTOMER DEMANDS FOR CHANGES	First	0	50	4
	Second	17	0	15
	Third	0	0	0
	Weighted Importance	0.3	1.5	0.4
INCREASE PROFITABILITY	First	0	0	0
	Second	0	0	0
	Third	0	50	4
	Weighted Importance	0.0	0.5	0.0
INCREASE PRODUCTIVITY	First	0	0	0
	Second	0	50	4
	Third	17	0	15
	Weighted Importance	0.2	1.0	0.2
INCREASE QUALITY	First	0	50	4
	Second	17	0	15
	Third	0	0	0
	Weighted Importance	0.3	1.5	0.4
INCREASE MANAGEMENT INFORMATION	First	17	0	15
	Second	17	50	19
	Third	0	0	0
	Weighted Importance	0.8	1.0	0.9
LOWER COSTS	First	33	0	31
	Second	17	0	15
	Third	0	0	0
	Weighted Importance	1.3	0.0	1.2
INCREASE SKILLS/ ORGANIZATIONAL CAPABILITY	First	17	0	15
	Second	0	0	0
	Third	17	50	19
	Weighted Importance	0.7	0.5	0.7

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

- Data base services are present in all the medium firms and, by 1990, will be incorporated by most of the small firms.

3.1.4 Telecommunications Technologies

- Large firms have taken full advantage of both private automatic branch exchange (PABX) and facsimile with built-in microprocessor (FAX) and the small firms anticipate some catching up in the next five years.

- Half of the large firms presently employ satellite/microwave systems but plan no further purchases. The small firms meanwhile anticipate some investment through to 1995.

- Half of the small firms have taken advantage of electronic mail with additional adoption anticipated while the medium sized firms expect to make purchases over the next ten years.

- The small firms only are beginning to use videotex and fibre optics but the medium sized firms have no future plans in this area.

3.2 Forces Driving the Need to Adopt New Technology

Four main forces are driving these firms to adopt new technologies. Table 17 summarizes the responses and the following paragraph discusses the key factors. These are:

- Competitive pressures,
- Lower costs,

Results of Question 5

TABLE 18: MANAGEMENT AND BUSINESS CONSULTANTS

SIC 867

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size: Small (20-199)	Medium (200-999)	Total Firms
ABILITY TO FINANCE	First	40	0	36
	Second	0	0	0
	Third	0	0	0
	Weighted Importance (1)	1.2	0.0	1.1
COST OF NEW TECHNOLOGY	First	20	0	18
	Second	20	50	23
	Third	0	0	0
	Weighted Importance	1.0	1.0	1.0
POOR ECONOMIC CONDITIONS	First	20	0	18
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	0.6	0.0	0.5
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0	0	0
	Second	0	0	0
	Third	0	50	5
	Weighted Importance	0.0	0.5	0.1
UNWILLINGNESS TO CHANGE	First	0	100	9
	Second	20	0	18
	Third	0	0	0
	Weighted Importance	0.4	3.0	0.6
ALL OTHERS	First	20	0	18
	Second	0	50	5
	Third	0	0	0
	Weighted Importance	0.6	1.0	0.6

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

- Increase management information, and
- Increase skills/organizational capability.

However, the ranking of these factors differed substantially between small and medium firms. Small firms emphasized competitive pressures and lower costs, while medium firms emphasized customer demands for changes, and increase quality. These participants emphasized that growing "client and service needs" and the promise of "enhanced capabilities in providing a better quality product", act as catalysts in accelerating adoption of new technologies.

3.3 Factors that Could Slow the Rate of Technology Adoption

The factors that tend to slow the rate at which management and business consultants adopt new technologies are summarized in Table 18. The most important factors for all reporting firms, in order of decreasing importance are:

- Ability to finance,
- Cost of new technology,
- Unwillingness to change, and
- Poor economic conditions.

However, small firms' choice of slowing factors were spread across all of the above mentioned, while medium firms suggested that unwillingness to change and cost of technology were the main causal factors.

In summary, small firms in the Management and Business Consulting Industry have been, and will continue to be more aggressive than medium firms in adopting new technologies. The preponderance of reporting medium firms have plans to adopt some of the new technologies in the next five years, but limited plans to adopt them between 1990-1995.

Results of Question 1

TABLE 19: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Operating Revenue in Ontario

Average Annual Compound Rate of Change (in Constant Dollars) (1)

Firms by Employment Size	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Small (20-199)	1.0	8.0	7.5	9.0	9.0
Medium (200-999)	5.0	11.0	8.0	8.0	8.0
Total Firms	1.0	8.0	7.5	9.0	9.0

(1) Rounded to closest 0.5 %

4.0 INDUSTRY OUTLOOK TO 1995

This chapter describes the respondents' views of the outlook for the industry in terms of aggregate output (i.e., operating revenue in Ontario), investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

Operating revenues were estimated by the firms surveyed to have increased by 1.0 percent in 1983. Growth is then estimated to have risen to 8 percent in 1984 and 7.5 percent in 1985. Both small and medium firms are optimistic about the growth over the next ten years. A projected 9.0 percent growth rate for the 1985 to 1995 period is estimated by the reporting firms (see Table 19).

4.2 Investment Patterns

Capital investment in the Ontario industry will be exclusively devoted to machinery and equipment and about 70 percent will be related to the implementation of new technologies.

4.2.1 Justifying Financial Investment in New Technologies

When considering investments in new technology, 40 percent of small firms use the concept of pay-back period in assessing such a decision while no medium firms surveyed used this method. On average, small firms expect a pay-back in approximately 2.5 years. Return on investment is used by 59 percent of all firms to evaluate investments, and on average, a 25 percent return is expected.

Results of Question 17e

TABLE 20: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period: % of Firms Using Pay-Back	Pay-Back Period: Average Period (Years)	Return on Investment: % of Firms Using ROI	Return on Investment: Average Rate (%)
Small (20-199)	40	2.5	60	25
Medium (200-999)	0	-	50	25
Total Firms	36	2.5	59	25

Answers not mutually exclusive.

Results of Question 17f

TABLE 21: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Source of Funds for New Technology Spending

Employment Size	Internal Funds (Percent)	External Funds (Percent)
Small (20-199)	87	13
Medium (200-999)	63	37
Total Firms	85	15

4.2.2 Source of New Capital Spending

The small firms surveyed rely heavily, 90 percent, on internal sources of funds to finance investment. Medium firms use both internal and external sources of funds, 60 percent and 40 percent respectively.

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate employment.

4.3.1 Factors Affecting Employment

When asked to identify the most important factors affecting the firm's employment level in Ontario, respondents identified the following:

- Overall economic growth,
- Ability to compete, and
- Industry-wide growth.

Medium firms also emphasized the introduction of new technology.

Table 22 summarizes the survey results.

4.3.2 Employment Outlook

From 1971 to 1981 employment in the Management and Business Consulting Industry grew at an average annual rate of 17.2 percent according to census data. The survey findings in Table 23 indicate that the employment rate increased by 1.0 percent per year between 1981 and 1984 period and by 6.5 percent in 1985. No information

Results of Question 11a,b,c

TABLE 22: MANAGEMENT AND BUSINESS CONSULTANTS — SIC 867

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size: Small (20-199)	Medium (200-999)	Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	0	0	0
	Second	0	0	0
	Third	17	0	15
	Weighted Importance (1)	0.2	0.0	0.2
INCREASE SALES/ INCREASE MARKET SHARE	First	0	0	0
	Second	17	0	15
	Third	0	0	0
	Weighted Importance	0.3	0.0	0.3
INTRODUCTION OF NEW TECHNOLOGY	First	0	50	4
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	0.0	1.5	0.1
AVAILABILITY OF NECESSARY SKILLS	First	0	0	0
	Second	17	0	15
	Third	0	0	0
	Weighted Importance	0.3	0.0	0.3
ABILITY TO COMPETE	First	17	0	15
	Second	17	0	15
	Third	0	0	0
	Weighted Importance	0.8	0.0	0.8
INDUSTRY-WIDE GROWTH	First	17	50	19
	Second	0	0	0
	Third	17	0	15
	Weighted Importance	0.7	1.5	0.7
OVERALL ECONOMIC GROWTH	First	33	0	31
	Second	33	100	39
	Third	0	0	0
	Weighted Importance	1.7	2.0	1.7
FOREIGN EXCHANGE RATE/CANADIAN COMPETITIVENESS	First	17	0	15
	Second	0	50	4
	Third	0	0	0
	Weighted Importance	0.5	0.5	0.5
ALL OTHERS	First	17	0	15
	Second	0	0	0
	Third	0	0	0
	Weighted Importance	0.5	0.0	0.5

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 11d

TABLE 23: MANAGEMENT AND BUSINESS CONSULTANTS — SIC 867

Firms' Employment Trends in Ontario

Firms by Employment Size	Total Employment and Average Annual Compound Rate of Change (1)			
	Estimated		Expected	
	Rate		Rate	
	1981-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	1.0	6.5	4.5	3.5
Medium (100-499)	n.a.	n.a.	n.a.	n.a.
Total Firms	1.0	6.5	4.5	3.5

(1) Rounded to closest 0.5%.
n.a. no answer.

Results of Question 12

TABLE 24: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	21.1	23.9	24.2	28.7	30.6
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	13.5	13.0	13.5	14.3	14.0
• Engineers		0	0	0	0
• Engineering Technicians and Technologists		0	0	0	0
• Systems Analysts and Computer Programmers		-	+	+	0
CLERICAL	56.2	52.7	51.7	43.3	40.2
• Secretaries		-	0	-	0
• Typists/Clerk Typists (includes Word Processing Operators)		0	0	+	0
• Bookkeepers and Accounting Clerks		0	0	-	-
• EDP Equipment Operators		0	+	0	0
• General Office Clerks		0	0	-	-
• All Other Clerks		0	0	-	0
SALES	1.4	1.3	1.5	2.2	1.8
OTHER OCCUPATIONS	7.8	9.1	9.1	11.5	13.4
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

regarding employment trends in the 1985 to 1995 period was indicated by medium reporting firms. The small firms expect employment to grow at a rate of 4.5 percent a year in the period 1985 to 1990 and 3.5 percent a year between 1990-1995.

4.3.3 Trends in Part-Time Work

Part-time employment is not a major factor in the Management and Business Consulting Industry, accounting for less than 4.0 percent of total employment in 1981, 1984 and 1985. However, small firms expect to increase their use of part-time workers in the 1985 to 1990 period to about 8.5 percent and to 9.0 percent in the 1990 to 1995 forecast period. This will raise the average for all firms to about 4.5 percent over the forecast period.

4.4 Changes in Occupational Structure

Table 24 shows trends in occupational structure (i.e., percent of total industry employment by occupation). Respondents expect the number of jobs in the industry to increase over the next ten years, but the relative share by occupational group will differ.

The survey shows the following occupational shifts:

- A significant decline in Clerical occupations from 1985 to 1990, followed by a smaller decline from 1990 to 1995.
- An increase in the proportion of the Natural Sciences, Engineering and the Mathematical occupations from 1985 to 1990, and a slight decrease from 1990 to 1995.
- A minimal increase in Sales.
- Steady increases in Other occupations.

Results of Question 6

TABLE 25: MANAGEMENT AND BUSINESS CONSULTANTS — SIC 867

Impact of Technology on Selected Occupations in Firms
1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	5	59	36
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineers	0	0	100
• Engineering Technicians and Technologists	0	5	95
• Systems Analysts and Computer Programmers	0	27	73
CLERICAL			
• Secretaries	23	36	41
• Typists/Clerk Typists (includes Word Processing Operators)	46	18	36
• Bookkeepers and Accounting Clerks	9	18	73
• EDP Equipment Operators	9	18	73
• General Office Clerks	23	36	41
SALES	0	28	72
OTHER OCCUPATIONS	0	1	99

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This chapter reviews the survey results on the employment effects of new technology in terms of skills match and requirements and the impact on skill levels and job content.

5.1 Effects on Occupations

Table 25 summarizes firms' expectations of technology's impact on occupational requirements. The preponderance of occupations listed are projected to be neither in short supply nor in oversupply. However, given this, there were some occupations where a shortage is expected to occur. The figures in brackets refer to the percent of firms expecting the shortage:

- Managerial Administrative and Related (59%),
- Secretaries and general office clerks (36%),
- Systems analysts and computer programmers (27%),
- Sales (28%), and
- Bookkeepers and accounting clerks, and EDP equipment Operators (18%).

The occupation where an oversupply may occur is:

- Typist/clerk typists which includes word processing operators (46%).

5.2 Likely Steps to Deal With Skills Oversupply

In dealing with a potential oversupply of skills in their organizations, the most commonly cited steps are shown in Table 26 and summarized below:

Results of Question 7

TABLE 26: MANAGEMENT AND BUSINESS CONSULTANTS — SIC 867

Steps Firms Will Likely Take to Deal With OVERSUPPLY of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Early Retirement	(1)	(1)
CLERICAL			
• Secretaries	Attrition	Retrain	(2)
• Typists/Clerk Typists (includes Word Processing Operators)	Shorter Hours	Retrain	Upgrade
• Bookkeepers and Accounting Clerks	Attrition	Upgrade	Layoffs
• EDP Equipment Operators	Attrition	Upgrade	Retrain
• General Office Clerks	Shorter Hours	Upgrade	Layoffs
OTHER OCCUPATIONS	Retrain	Layoffs	(2)

(1) Only 1 step mentioned.
(2) Only 2 steps mentioned.

Response	Most Common	Second Most Common	Third Most Common
Attrition	3		
Shorter hours	2		
Retraining	1	2	1
Early retirement	1		
Upgrading		3	1
Layoffs		1	2

The dominant response is attrition with shorter hours and retraining ranked second and third respectively. Early retirement is mentioned only in connection with Managerial, Administrative and Related occupations. Early retirement and layoffs are the least preferable options.

5.3 Likely Steps to Cope with Skills Shortages

In coping with anticipated skill shortages, the most commonly cited responses are shown in Table 27 and summarized below.

Response	Most Common	Second Most Common	Third Most Common
Retrain	6		
Recruit	3	3	
Upgrading		2	
Contracting Out			2

The dominant response by reporting firms will be to retrain staff. Recruiting and upgrading rank second and third, and contracting out falls well behind the other options. Contracting out is mentioned only with regard to system analysts and computer programmers.

Results of Question 8

TABLE 27: MANAGEMENT AND BUSINESS CONSULTANTS — SIC 867

Steps Firms Will Likely Take to Deal With SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND RELATED	Retrain	Recruit	Contract Out
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Engineering Technicians and Technologists	Recruit	(1)	(1)
• Systems Analysts and Computer Programmers	Recruit	Upgrade	Contract Out
CLERICAL			
• Secretaries	Retrain	Upgrade	(2)
• Typists/Clerk Typists (includes Word Processing Operators)	Retrain	Recruit	(2)
• Bookkeepers and Accounting Clerks	Retrain	(1)	(1)
• EDP Equipment Operators	Retrain	(1)	(1)
• General Office Clerks	Retrain	Recruit	(2)
SALES	Recruit	(1)	(1)

(1) Only 1 step mentioned.
(2) Only 2 steps mentioned.

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to rank the impact of new technologies on selected occupations in terms of:

- Skills required,
- Time to achieve proficiency, and
- Knowledge of firm's operations.

The results are summarized in Table 28.

Respondents expect the skill levels required to rise in most occupations. The largest number of respondents expect an increase in skill levels in the following occupations: Managerial (94%); engineers (80%); engineering technicians and technologists (100%); Sales (100%); other occupations (100%); typists (71%); and secretaries (65%).

There was somewhat less concern about an increase in time required to achieve proficiency, but firms did note increases as follows: engineering technicians and technologists (100%); Sales (100%), and other occupations (100%). The majority of firms felt that the time needed for proficiency and the amount of knowledge of firm's operations would remain constant for most occupations.

5.5 Training Costs and New Technology

Management and business consultants in both small and medium firms estimate that they currently spend the equivalent of 3 to 4 percent of labour costs in training, and that this amount will remain constant over the next ten years. Small firms estimate that 51 percent of their training costs are related to new technology and anticipate little reduction in the future. Medium firms estimate spending less, 15 percent, on new technology and expect this amount to increase to 35 percent by 1990 and decrease significantly to 10 percent by 1995.

Results of Question 9

TABLE 28: MANAGEMENT AND BUSINESS CONSULTANTS SIC 867

Impact of Technology on Skill Levels and Job Content

Occupations	Percent of Firms (1)								
	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	94	0	6	50	0	50	28	0	73
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	80	0	20	0	0	100	0	0	100
• Engineering Technicians and Technologists	100	0	0	100	0	0	100	0	0
• Systems Analysts and Computer Programmers	36	0	64	36	0	64	7	0	93
CLERICAL									
• Secretaries	65	0	35	19	0	81	4	0	96
• Typists/Clerk Typists includes Word Processing Operators)	71	0	29	14	0	86	14	0	86
• Bookkeepers and Accounting Clerks	43	29	29	14	0	86	43	0	57
• EDP Equipment Operators	36	28	36	7	0	93	7	0	93
• General Office Clerks	38	31	31	39	0	61	39	0	61
SALES	100	0	0	100	0	0	100	0	0
OTHER OCCUPATIONS	100	0	0	100	0	0	100	0	0

+ increase - decrease 0 remain the same
(1) Non-responses excluded.

6.0 LABOUR RELATIONS ENVIRONMENT

There is no indication of any union activity historically or at present within this industry as referenced by the Ontario Ministry of Labour.

6.1 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and or/quality and adopting new technology.

The following summarizes the survey results:

- All medium firms surveyed have some mechanism for worker participation at the company level and division/plant level.

- 75 percent of small firms have such a mechanism only at the department/area level, while all firms encourage worker participation at the working group level.

- All medium firms and 67 percent of small firms surveyed have a mechanism for discussion with respect to improving productivity/quality.

- 50 percent of all firms have mechanisms for participation in the adoption of new technology.

6.2 Views on Involving Workers in Decisions on Adopting New Technology

Management was also asked to what extent and how they should involve workers in decisions regarding the adoption of new

technologies. Firms were divided in their views on the extent of involvement:

- 50 percent of firms surveyed favoured the use of training programs,
- 40 percent favoured limiting involvement to information only, and
- 10 percent favoured full involvement.

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports the survey results regarding questions related to planning for technological change. A summary of these results appears in Table 29.

The respondents indicate that about 80 percent of the industry makes use of a strategic plan, with small firms generally more likely to have plans than medium firms. Both human resource plans and capital investment plans for new technology are established with 54 percent and 23 percent respectively. The firms' average planning horizon is about four years which is slightly longer than their anticipated pay-back period for investment in new technology.

On average these plans are well integrated.

Results of Question 18

TABLE 29: MANAGEMENT AND BUSINESS CONSULTANTS

SIC 867

Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Small (20-199)	83	50	4 years	17	3 years	4.0
Medium (200-999)	50	100	4 years	100	4 years	4.5
Total Firms	81	54	4 years	23	4 years	4.2

(1) Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

PART IV - APPENDICES

Part IV of this report presents the appendices referred to in Parts I and II.

These appendices are:

Appendix	Title	Reference
A	Firm Employment Size Categories Used in the Survey of the Computer Services and Management Consulting Industry	Part I
B	Questionnaire Responses by Question • Computer Services • Management Consulting	Part I Part III
C	Reliability of the Sample	Part I
D Page D.1 Page D.10	Historical Tables • Computer Services • Management Consulting	Part II

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE COMPUTER SERVICES AND MANAGEMENT CONSULTING INDUSTRY

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE COMPUTER SERVICES AND MANAGEMENT CONSULTING INDUSTRY

Size Categories Used to Stratify the Sample Frame	Size Categories Used to Weight and Report Survey Results	
Number of Employees		Number of Employees
20 - 49		
50 - 99	Small	20 - 199
100 - 199		
200 - 499	Medium	200 - 999
500 - 999		
1000 - 1499		
1500 - 2499	Large	1,000 or more
2500 - 4999		
5000 or more		

APPENDIX B

QUESTIONNAIRE

AND

RESPONSES BY QUESTION

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

BUSINESS & MANAGEMENT
CONSULTANTS
(SIC 867)
QUESTIONNAIRE

Currie, Coopers
& Lybrand

INTRODUCTION

Thank you for agreeing to participate in the study. It is being carried out for the Ontario Task Force on Employment and New Technology, a joint labour-management group. Their mandate is to examine the extent and nature of employment change likely to result from the introduction and application of new technology in Ontario over the next ten years.

You Will Receive The Survey Results
As a participant, you will receive a report on the survey results for your industry.

All Responses Will Be Confidential
All responses will be held in strictest confidence. Responses will be analysed and used only at an industry-wide level.

Both Organized Labour and Management Are Being Surveyed
Management and organized labour participants, in the case of unionized firms, will both receive a questionnaire. We realize that labour participants may not be able to answer some of the questions. In particular, they may find difficulty in answering questions: 10, 11, 12, 13 and 17.

Participants May Want to Consult Key Resource People in Responding
The questionnaire is not necessarily meant to be completed by only one respondent. It may be appropriate and even desirable for survey participants to consult other key resource people in their organization before responding to the questionnaire. Respondents should indicate on the Participant Information (p.4), the "principle respondent" and "other respondents" as well as the Section(s) of the questionnaire to which they contributed.

You Will Save Time if Information is Filled in Before the Interview
A number of questions relate to your organization's past or present workforce and future plans. We are requesting management respondents to provide accurate information from their organization's records in advance of the interview. This step will reduce the time needed for the actual interview and also make it more meaningful. The Participant Information (p.4) and the following questions should be filled in prior to the management interview: 3, 6 to 13 inclusive, 15 and 17.

Group Interviews Are Possible
In some cases the principle respondent may want to arrange a group interview between himself, key resource people and our consultant. We would welcome such an arrangement. This option is open to either management or labour participants.

You May Wish to Complete the Entire Questionnaire Before the Interview
The entire questionnaire could be completed in advance of the interview. If this is convenient, please do so. We would, however, still wish to spend a half-hour with you to review your responses.

Your "Best" Estimate
Where estimates are required, we are asking respondents to provide us with their "best estimate". Estimating future trends is difficult. Our premise is that an expert inside the organization is in the best position to make them, based on his or her knowledge of the organization's future direction.

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EXHIBIT A

SELECTED OCCUPATIONS: MANAGEMENT & BUSINESS CONSULTING, SIC 867

MANAGERIAL, ADMINISTRATIVE & RELATED (includes senior and middle management and administrative support officers. See note re., 'Consultants' below*).

NATURAL SCIENCE, ENGINEERING & MATHEMATICS

Engineers
Engineering Technicians & Technologists
Systems Analysts & Computer Programmers

CLERICAL

Secretaries
Typists/Clerk Typists (includes Word Processing Operators)
Bookkeeping & Accounting Clerks
EDP Equipment Operators
General Office Clerks

SALES (e.g., Technical Salesmen, Sales Representatives, Business Service Salesmen).

* Please Note: Consultants should be designated according to the same title and classification as a non-consultant (e.g., Engineering Consultant, Computer Consultant) except where an occupation is not listed then include in Managerial, Administrative & Related.

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The Study is Focusing on Selected Occupations

The Task Force for your industry is focusing on chosen major occupational groups and selected occupations within these major groups. These are listed in Exhibit A. The job titles and definitions being used are from the "Canadian Classification and Dictionary of Occupations, 1971" (CCDO). The CCDO is a universal system of job titles and descriptions. Our consultants are available to assist you or your staff in clarifying which of your organization's positions should be considered in the CCDO titles listed in Exhibit A.

Please Call If You Have Any Enquiries

Should you or your staff require any assistance, please call Sandra Skivsky of our firm or the consultant who will be interviewing you, at 366-1921.

Your Participation Is Appreciated

While we appreciate that your participation in the survey puts a demand on your time and organization, we would emphasize that your contribution will have an important impact on the results of this project.

PARTICIPANT INFORMATION

ORGANIZATION NAME: _____
UNION NAME (If appropriate): _____
AFFILIATED ORGANIZATIONS: _____
MAIN ADDRESS: _____
TELEPHONE NUMBER: ( ) _____

BRIEF DESCRIPTION OF OPERATION IN ONTARIO

Divisions/Branches/Affiliates	Products/Services

SURVEY PARTICIPANTS

Names	Position	Number of Years With Employer	Number of Years With Industry	Check (✓) Sections Answered II	III	IV	V	VI	VII
(principal respondent)				☐	☐	☐	☐	☐	☐
(other respondents)				☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐
				☐	☐	☐	☐	☐	☐

SIC 867

1. INDUSTRY-WIDE OPERATING REVENUE IN ONTARIO

Would you please indicate for the following periods listed below (i.e. 1983 to 1995) your **estimates** of **average** annual growth (+) or decline (-) in **operating revenue in ONTARIO** for the Management and Business Consulting Industry in ONTARIO.

For your information, revenue includes such things as sales, fees, commissions, etc.

Operating Revenue in Ontario	Annual Compound Rate of Change (Indicate if + or -)
1982 to 1983?	___ %
1983 to 1984?	___ %
1984 to 1985?	___ %
1985 to 1990? (average)	___ %
1990 to 1995? (average)	___ %

2. INDUSTRY-WIDE OUTLOOK - EMPLOYMENT IN ONTARIO

The table below indicates total employment and annual compound rates of change for the Management and Business Consulting Industry in ONTARIO for the years 1971 and 1981. (Census data, Ontario Ministry of Labour).

Would you please indicate your estimates for the following periods listed below (i.e., 1982-1995) for ONTARIO. Provide your estimates in actual numbers or in annual compound rates of change, whichever is easier.

For your information, total employment covers full-time, part-time, temporary, casual and contract - i.e. total "head count".

Total Employment in Ontario		Annual Compound Rates of Change
1971	2,245	
1981	10,975	+ 17.2%

Your Estimates:				(Indicate if + or -)
1982?	_____	OR	1981-1982?	___ %
1983?	_____	OR	1982-1983?	___ %
1984?	_____	OR	1983-1984?	___ %
1985?	_____	OR	1984-1985?	___ %
1990?	_____	OR	1985-1990?	___ %
1995?	_____	OR	1990-1995?	___ %

3. ORGANIZATION'S ADOPTION OF TECHNOLOGIES

The following questions refer to new technologies your organization has already or may adopt over the next ten years in ONTARIO.

3a. Please indicate the technologies that have already been adopted by your organization. Record your answer on Chart 3, opposite, under column 3a.

3b. Please indicate the technologies that will probably be adopted by your organization between 1985 and 1990. Record your answer on Chart 3, under column 3b. It may be appropriate to check more than one time period.

3c. Please indicate the technologies that will probably be adopted by your organization between 1990 and 1995. Record your answer on Chart 3, under column 3c. It may be appropriate to check more than one time period.

CHART 3

TECHNOLOGIES ADOPTED OR TO BE ADOPTED BY YOUR ORGANIZATION

	3a ADOPTED IN 1984 OR BEFORE	3b WILL BE ADOPTED BETWEEN 1985-1990?	3c WILL BE ADOPTED BETWEEN 1990-1995?
1. SERVICE DELIVERY TECHNOLOGIES			
Installed Customized Software Systems	☐	☐	☐
Installed Customized Hardware Systems	☐	☐	☐
On-Line Client Access to Data Bases	☐	☐	☐
On-Line Interactive System With Clients	☐	☐	☐
Video Conferencing	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
_____	☐	☐	☐
2. DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	☐	☐	☐
Computer-Aided Engineering (CAE)	☐	☐	☐
4th Generation Computer Languages	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
_____	☐	☐	☐
3. OFFICE AUTOMATION TECHNOLOGIES			
Mainframe/Mini-Computers	☐	☐	☐
Word Processing	☐	☐	☐
Microcomputers	☐	☐	☐
Data Base Services (External)	☐	☐	☐
Electronic Filing	☐	☐	☐
Internal Data Base Management Systems	☐	☐	☐
Local Area Networks (LAN)	☐	☐	☐
Home Terminals	☐	☐	☐
Voice Activated Computers	☐	☐	☐
Artificial Intelligence/Expert Systems	☐	☐	☐
Fully Integrated Work Stations	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
_____	☐	☐	☐
4. TELECOMMUNICATIONS TECHNOLOGIES			
Private Automatic Branch Exchange (PABX)	☐	☐	☐
Electronic Mail	☐	☐	☐
Facsimile with Built-in Microprocessor (FAX)	☐	☐	☐
Satellite/Microwave Systems	☐	☐	☐
Videotex	☐	☐	☐
Fibre Optics	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
5. ANY OTHER TECHNOLOGIES			
_____	☐	☐	☐
_____	☐	☐	☐
_____	☐	☐	☐
HAVE/WILL NOT ADOPT ANY NEW TECHNOLOGIES IN THIS PERIOD	☐	☐	☐

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4. FORCES DRIVING THE ORGANIZATION'S NEED FOR NEW TECHNOLOGIES OVER THE NEXT 10 YEARS

4a. What is the **single most important driving factor** in your organization's internal or external environment which could accelerate your organization's **need to adopt** these new technologies over the next 10 years in ONTARIO?

4b. What is the **second most important factor** likely to accelerate your organization's need to adopt these new technologies?

4c. And what is the **third most important factor**?

5. FACTORS AFFECTING THE ORGANIZATION'S RATE OF TECHNOLOGY ADOPTION OVER THE NEXT 10 YEARS

5a. What is the **single most important factor** in your organization's internal or external environment that could <u>slow down</u> the speed at which your organization will adopt these new technologies over the next 10 years in ONTARIO?

5b. What is the **second most important** factor that could slow down your organization's adoption of these new technologies?

5c. And what is the **third most important factor**?

6. IMPACT OF TECHNOLOGY ON OCCUPATIONS OVER THE NEXT 10 YEARS

The following questions attempt to determine impacts on specific occupations you expect to be caused by the adoption of new technologies in your organization over the next 10 years in ONTARIO.

6a. Please indicate the **occupations** in which your organization is likely to have an **oversupply of people** over the next 10 years as a result of the adoption of these new technologies. Record your answer on Chart 6, opposite, under column 6a.

6b. Please indicate the **occupations** in which you expect your organization will have a **shortage of the skills** required to cope with these new technologies. Record your answer on Chart 6, under column 6b.

CHART 6

IMPACT OF TECHNOLOGIES ON SELECTED OCCUPATIONS IN YOUR ORGANIZATION OVER THE NEXT 10 YEARS

	6a OCCUPATIONS WITH AN OVERSUPPLY OF SKILLS	6b OCCUPATIONS WITH A SHORTAGE OF THE REQUIRED SKILLS
MANAGERIAL, ADMINISTRATIVE & RELATED (Includes Consultants not listed below)	☐	☐
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers	☐	☐
• Engineering Technicians & Technologists	☐	☐
• Systems Analysts & Computer Programmers	☐	☐
CLERICAL		
• Secretaries	☐	☐
• Typists/Clerk Typists	☐	☐
• Bookkeeping & Accounting Clerks	☐	☐
• EDP Equipment Operators	☐	☐
• General Office Clerks	☐	☐
SALES	☐	☐
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____	☐	☐
_____	☐	☐
_____	☐	☐

SIC 867

7. ACTIONS TO DEAL WITH OVERSUPPLY OF SKILLS IN ORGANIZATION OVER NEXT 10 YEARS

The following questions relate to the actions your organization will likely take to deal with the oversupply of people in your organization resulting from the adoption of these new technologies in ONTARIO.

7a. For each occupation with a potential oversupply of skills (as you indicated in Q.6a), please identify the steps your organization will likely take that will affect the largest number of people in that occupation. Record your answers on Chart 7, opposite, under column 7a.

In answering this and the following question, please consider the possible actions listed below as well as any other possible action not in the list but that your organization is likely to take.

Possible Actions

- Attrition
- Early Retirement
- Layoffs
- Relocation (geographic)
- Shorter hours/work week
- Job sharing
- Change from full-time to part-time
- Retraining
- Lateral transfer
- Upgrading
- Downgrading
- Etc., etc.

7b. Again, for each of these occupations, identify the step your organization may take that will affect the second largest number of people in that occupation. Record on Chart 7, under column 7b.

CHART 7

STEPS YOUR ORGANIZATION WILL LIKELY TAKE
TO DEAL WITH OVERSUPPLY OF SKILLS OVER NEXT 10 YEARS

OCCUPATIONS	7a STEPS THAT WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	7b STEPS THAT WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED (Includes Consultants not listed below)		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
CLERICAL		
• Secretaries		
• Typists/Clerk Typists		
• Bookkeeping & Accounting Clerks		
• EDP Equipment Operators		
• General Office Clerks		
SALES		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		

8. STEPS TO ACQUIRE THE NEW SKILL REQUIREMENTS OVER THE NEXT 10 YEARS

The following questions are intended to identify the most likely steps your organization may take to acquire the new skill requirements associated with the new technologies over the next 10 years in ONTARIO.

8a. Please indicate, for each occupation with a potential shortage of the new skill requirements (as you indicated in Q6b), the step your organization will likely take that will affect the largest number of people in that occupation. Record your answers on Chart 8, column 8a.

Please consider the possible actions listed below as well as any other action (not listed) that your organization is likely to take.

Likely Steps

- Retraining
- Relocation
- Upgrading
- Increased overtime of organization's skill people
- Recruiting full-time skilled people
- Recruiting part-time skilled people
- Contracting work out
- Etc., etc.

8b. Please indicate, for each occupation, the step your organization may take that will affect the second largest number of people in that occupation. Record your answers in column 8b.

CHART 8

STEPS YOUR ORGANIZATION WILL TAKE
OVER NEXT 10 YEARS TO ACQUIRE THE NEW SKILL REQUIREMENTS

OCCUPATIONS	8a STEP WHICH WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	8b STEP WHICH WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED (Includes Consultants not listed below)		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
CLERICAL		
• Secretaries		
• Typists/Clerk Typists		
• Bookkeeping & Accounting Clerks		
• EDP Equipment Operators		
• General Office Clerks		
SALES		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

9. NATURE OF IMPACT ON SKILLS AND JOB CONTENT OVER THE NEXT TEN YEARS

The following questions are meant to identify the nature of the impact on selected occupations in ONTARIO.

9a. For selected occupations in your organization, please indicate how the new technologies will affect each in their daily work. That is, will their daily work require greater skill (+), less skill (-), or about the same skill (0) as they currently require. Record your answers on Chart 9, opposite, under Column 9a.

9b. Please indicate whether the new skills they require will demand more time (+), less time (-), or about the same time (0) to achieve the proficiency that they will need. Record your answers on Chart 9, column 9b.

9c. Please indicate whether, in using these new technologies, these occupations will require more knowledge (+) of the organization's operations, less knowledge (-), or about the same (0) amount of knowledge as is currently required to perform their daily tasks. Record your answers on Chart 9, under 9c.

CHART 9

IMPACT OF TECHNOLOGY ON SKILL LEVELS AND JOB CONTENT

	9a SKILLS REQUIRED (+, -, 0)	9b TIME TO ACHIEVE PROFICIENCY (+, -, 0)	9c KNOWLEDGE OF COMPANY'S OPERATIONS (+, -, 0)	COMMENTS
MANAGERIAL, ADMINISTRATIVE, & RELATED (Includes Consultants not listed above)	___	___	___	_____
NATURAL SCIENCE, ENGINEERING & MATHEMATICS				
• Engineers	___	___	___	_____
• Engineering Technicians & Technologists	___	___	___	_____
• Systems Analysts & Computer Programmers	___	___	___	_____
CLERICAL OCCUPATIONS				
• Secretaries	___	___	___	_____
• Typists/Clerk Typists	___	___	___	_____
• Bookkeeping & Accounting Clerks	___	___	___	_____
• EDP Equipment Operators	___	___	___	_____
• General Office Clerks	___	___	___	_____
SALES	___	___	___	_____
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?				
_____	___	___	___	_____
_____	___	___	___	_____
_____	___	___	___	_____

10. TRAINING/RETRAINING

These questions are about the current and future importance of training and retraining in your organization.

10a. Please indicate what were your organization's total training costs as a percent of total labour costs in 1981. Record your answer on Chart 10, line 10a.

Training costs include the costs of internally or externally provided training programs, classroom and on-the-job workshops, vouchers or tuition credits, provided by your organization, which are intended to train employees to perform their jobs or to retrain employees to assume new or alternate jobs. Labour costs include all wages, salaries and benefits. (e.g., $\frac{\text{Total Training Costs}}{\text{Total Labour Costs}} \times 100 = 1.0\%$)

10b. Please indicate what your organization's total training costs as a percent of total labour costs will be in 1984 (to year end). Record your answer on line 10b.

10c. What do you estimate for 1985, (line 10c)?

10d. What do you estimate it will be in 1990, (line 10d)?

10e. What do you estimate it will be in 1995, (line 10e)?

10f. For each year on Chart 10, (line 10a to 10e), please indicate what percent of total training costs in each year have or will go towards training people to adapt to the new technologies.

CHART 10

TRAINING COSTS OF YOUR ORGANIZATION

			As a Percent of Total Labour Costs	Percent of Total Training Costs Directly Related to New Technologies
10a.	1981?	Actual	___%	___%
10b.	1984?	Estimate	___%	___%
10c.	1985?	Estimate	___%	___%
10d.	1990?	Estimate	___%	___%
10e.	1995?	Estimate	___%	___%

11. ORGANIZATION'S EMPLOYMENT TRENDS

In this section, we would like to determine how the organization's employment levels in ONTARIO are likely to change over the next 10 years.

11a. To begin, considering all possible factors in your organization's internal and external environment, what is the single most important factor which will have an impact on your organization's level of employment in ONTARIO over the next 10 years? _____

_____

11b. The second most important factor? _____

_____

11c. The third most important factor? _____

_____

11d. Please indicate total employees (includes full-time, temporary, contract, casual, seasonal and part-time employment) in your organization in ONTARIO for 1971, 1981 and 1984 from your employment records. Record your answers on Chart 11, column 11d.

Please estimate future total employment in your organization in ONTARIO for 1985, 1990 and 1995.

11e. Please indicate the percent of your total employment in ONTARIO that are part-time employees (i.e., less than normal, full, work week), for 1981 and 1984. Record your answers on Chart 11, column 11e.

Also in column 11e, please estimate part-time employees as a percent of total employees in ONTARIO for 1985, 1990 and 1995.

11f. Please translate your total ONTARIO employment (include full-time, part-time, casual, temporary, seasonal) into a full-time equivalent (F.T.E.) figure for your organization for 1981 and 1984 in column 11f.

Also in column 11f, please estimate total employment in terms of a full-time equivalent (F.T.E.) for 1985, 1990 and 1995.

By F.T.E. we mean a normal, full, work week for a normal, full year. F.T.E. can be measured in a variety of ways depending on whatever is normal for your organization or industry. For example, if expressed in hours of work per year one FTE might range from 1750 to 2000 hours of work a year depending on the length of the normal work week (e.g., 35 hours/week x 50 weeks = 1750 hours, 40 hours/week x 50 weeks = 2000 hours.)

CHART 11

ORGANIZATION'S EMPLOYMENT TRENDS IN ONTARIO

	11d TOTAL EMPLOYMENT IN ONTARIO	11e PART-TIME EMPLOYEES AS A % OF TOTAL EMPLOYMENT	11f TOTAL EMPLOYMENT IN FULL-TIME EQUIVALENT (F.T.E.)
Actual Figures			
1971?	_____		
1981?	_____	_____ %	_____ FTE
1984?	_____	_____ %	_____ FTE
Your Estimates			
1985?	_____	_____ %	_____ FTE
1990?	_____	_____ %	_____ FTE
1995?	_____	_____ %	_____ FTE

12. CHANGES IN EMPLOYMENT STRUCTURE

This section is intended to measure the changes in the employment structure of your organization in ONTARIO between 1981 and 1995.

12a. Please indicate the actual percentage share of <u>each</u> occupation listed as a percent of your organization's total employment in ONTARIO in 1981. Record your answer on Chart 12, column 12a.

12b. Please indicate the actual percentage share of <u>each</u> selected occupation listed as a percent of your organization's total employment in ONTARIO in 1984. Record your answer in column 12b.

12c. Please estimate the same for each selected occupation in 1985. Record in column 12c.

12d. Please estimate the same for each selected occupation in 1990. Record in column 12d.

12e. Please estimate the same for each selected occupation in 1995. Record in column 12e.

CHART 12

TRENDS IN YOUR ORGANIZATION'S OCCUPATIONAL STRUCTURE BETWEEN 1981 AND 1995

	OCCUPATIONS AS A PERCENT OF TOTAL EMPLOYMENT OF THE FIRM IN ONTARIO					
	12a Actual 1981	12b Actual 1984	12c Estimate 1985	12d Estimate 1990	12e Estimate 1995	
	%	%	%	%	%	
MANAGERIAL, ADMINISTRATIVE, & RELATED (Includes Consultants not listed above)	☐	☐	☐	☐	☐	1a
NATURAL SCIENCE, ENGINEERING & MATHEMATICS	☐	☐	☐	☐	☐	2a
• Engineers	___	___	___	___	___	
• Engineering Technicians & Technologists	___	___	___	___	___	
• Systems Analysts & Computer Programmers	___	___	___	___	___	
• All Other Natural Sciences, Engineering & Mathematics (e.g., Draftsmen, not listed above)	___	___	___	___	___	
CLERICAL	☐	☐	☐	☐	☐	3a
• Secretaries	___	___	___	___	___	
• Typists/Clerk Typists	___	___	___	___	___	
• Bookkeeping & Accounting Clerks	___	___	___	___	___	
• EDP Equipment Operators	___	___	___	___	___	
• General Office Clerks	___	___	___	___	___	
• All Other Clerks (not listed above)	___	___	___	___	___	
SALES	☐	☐	☐	☐	☐	4a
ALL OTHER OCCUPATIONS	☐	☐	☐	☐	☐	5a
• FIRM'S TOTAL EMPLOYMENT IN ONTARIO (1+2+3+4+5 = 100%)	100%	100%	100%	100%	100%	

13. EMPLOYMENT STRUCTURE BY SEX

The following questions refer to your organization's employment in ONTARIO by sex for each specific occupation listed in Chart 13.

13a. Please provide the percentage split between male and female of your employees in ONTARIO by each occupation in 1981. Record your answer on Chart 13, column 13a.

13b. Please provide the percentage split between male and female employees by occupation in ONTARIO in 1984. Record your answer in Column 13b.

CHART 13

EMPLOYMENT STRUCTURE BY SEX AND OCCUPATION IN ONTARIO

	13a 1981 EMPLOYMENT MALE	FEMALE	TOTAL	13b 1984 EMPLOYMENT MALE	FEMALE	TOTAL
MANAGERIAL, ADMINISTRATIVE & RELATED (Includes Consultants not listed above)	___% + ___% = 100%			___% + ___% = 100%		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						
• Engineers	___% + ___% = 100%			___% + ___% = 100%		
• Engineering Technicians & Technologists	___% + ___% = 100%			___% + ___% = 100%		
• Systems Analysts & Computer Programmers	___% + ___% = 100%			___% + ___% = 100%		
CLERICAL						
• Secretaries	___% + ___% = 100%			___% + ___% = 100%		
• Typists/Clerk Typists	___% + ___% = 100%			___% + ___% = 100%		
• Bookkeeping & Accounting Clerks	___% + ___% = 100%			___% + ___% = 100%		
• EDP Equipment Operators	___% + ___% = 100%			___% + ___% = 100%		
• General Office Clerks	___% + ___% = 100%			___% + ___% = 100%		
SALES	___% + ___% = 100%			___% + ___% = 100%		
FIRM'S TOTAL EMPLOYEES IN ONTARIO	___% + ___% = 100%			___% + ___% = 100%		

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14. ORGANIZED LABOUR IN YOUR ORGANIZATION IN ONTARIO

14a. Does your organization have any workers in ONTARIO covered by a collective labour agreement(s)?

Yes ☐ No ☐ If no, go on to Question 14c.

14b. If yes, what percent of your organization's total employment in ONTARIO is currently (1984) unionized?

_____%

14c. What percent of your organization's total employment in ONTARIO do you estimate will be unionized by 1985, 1990 and by 1995?

- 1985? _____%
- 1990? _____%
- 1995? _____%

14d. If you expect an increase in the percent of total employment that will be unionized, please indicate the specific occupational groups within which you expect the increase will take place.

_____

_____

15. ORGANIZED LABOUR AND TECHNOLOGY CHANGE

If any of the employees in your organization in ONTARIO are represented by a union, please answer the following series of questions. If none of the workers in your organization in ONTARIO are unionized, please go on to Question 16, p. 22.

15a. Please indicate the name of the union(s) in your organization in ONTARIO. Record your answers on Chart 15, on line 15a.

15b. On line 15b, please indicate the number of the organization's employees in ONTARIO in each union.

15c. On line 15c, indicate the worker groups in your organization the union(s) represents.

15d. On line 15d, check ☑ if the contract(s) has a technology change clause(s).

15e. On line 15e, check ☑ if the technology change clause(s) covers any of the following:

- Notice/Disclosure
- Consultation/Participation
- Joint Technology Change Committee
- Job Security
- Seniority
- Other (please specify).

15f. On line 15f, indicate whether the clause(s) is effectively administered. If your answer is "NO", please explain your answer.

CHART 15

ORGANIZED LABOUR IN ONTARIO

	(name of union)	(name of union)	(name of union)
15a. Name of Unions in Organization			
15b. Number of Organization's Employees in Each Union			
15c. Worker Groups Represented by Each Union			
15d. Does Union(s) Contract(s) Have a Technology Change Clause(s)?			
YES	☐	☐	☐
NO	☐	☐	☐
15e. Check ☑ if Technology Change Clause(s) Includes:			
• Notice/Disclosure	☐	☐	☐
• Consultation/Participation	☐	☐	☐
• Joint Technology Change Committee	☐	☐	☐
• Job Security	☐	☐	☐
• Seniority	☐	☐	☐
• Other _____ (specify)	☐	☐	☐
15f. Is the Clause Effectively Administered?			
YES	☐	☐	☐
NO	☐	☐	☐
If 'NO', explain			

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15g. In general, what has been the union's position on the adoption of new technologies in your organization? Please explain.

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16. THE NATURE OF WORKER INVOLVEMENT IN THE PROCESS OF TECHNOLOGY ADOPTION

The following questions are on the nature of the relationship between workers and management in your organization as decisions are made on the adoption of new technology.

16a. Does your organization have a formal mechanism for worker participation in any of the following? Please Check ☑ Yes or No

	YES	NO
• Setting production and/or sales targets:		
- at company level?	☐	☐
- at division/plant level?	☐	☐
- at department/area level?	☐	☐
- at working group level?	☐	☐
• Improving productivity/quality?	☐	☐
• Adoption of new technology?	☐	☐

16b. In your opinion, to what extent and how should management involve workers in decisions regarding the adoption of new technologies? Please comment.

_____

_____

_____

_____

_____

_____

17. FUTURE CAPITAL INVESTMENTS

17a. Please indicate how much, in today's dollars, your organization plans to spend on construction of structures and buildings in ONTARIO over the period 1985 to 1990 and over the period 1991 to 1995. Record your answer on Chart 17, column 17a.

17b. What percent of this spending can be directly attributed to the adoption of new technologies? Record under column 17b.

17c. Would you indicate how much, in today's dollars, your organization plans to spend on machinery and equipment over the period 1985 to 1990 and over the period 1991 to 1995 in ONTARIO. Record under column 17c.

17d. What percent of this spending on machinery and equipment will be for new technologies? Record under column 17d.

17e. Please indicate what criterion your organization will likely use to justify the financial investment in the new technologies.

Pay-back period ☐ _____

Return on investment ☐ If Yes, how long? _____

Other _____ ☐ If Yes, what rate? _____
(specify) Please elaborate

17f. Considering now your total capital investment in new technology over the next 10 years, what percent will be funded through internal funds and what percent will be funded through external funds?

Internal funds ___%
External funds ___%
100%

CHART 17

CAPITAL INVESTMENT PLANS
IN ONTARIO

	INVESTMENT IN STRUCTURES & BUILDINGS		INVESTMENT IN MACHINERY & EQUIPMENT	
	17a	17b	17c	17d
	IN TODAY'S DOLLARS (In Thousands $)	% DIRECTLY RELATED TO NEW TECHNOLOGY	IN TODAY'S DOLLARS (In Thousands $)	% FOR NEW TECHNOLOGY
1985 to 1990?	$_____	_____%	$_____	_____%
1991 to 1995?	$_____	_____%	$_____	_____%

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18. PLANNING FOR CHANGES IN TECHNOLOGY

These questions ask about your organization's plans for adopting new technologies in ONTARIO.

18a. Does your organization currently have a long-term strategic plan?

Yes ☐ No ☐

18b. Does your organization have a plan to deal with future human resource needs?

Yes ☐ No ☐ If no, go to Question 18d.

18c. Up to what year has your organization planned for its human resource needs?

_____
(WRITE IN YEAR)

18d. Does your organization have a capital investment plan dealing with the adoption of new technologies?

Yes ☐ No ☐ If no, go to Question 19. on p. 25.

18e. Up to what year has your organization planned for its capital requirements?

_____
(WRITE IN YEAR)

18f. On a scale of 1 to 5, please indicate to what extent these two plans (capital investment and human resource plans) are integrated.

(Please circle answer)

NOT AT ALL INTEGRATED 1 2 3 4 5 HIGHLY INTEGRATED

19. Please indicate below any other comments on the issue of employment and new technology you wish to make.

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

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COMPUTER SERVICES

Number of Firms and Unions Responding by Question

Question		Firms
Question 1	1982-1983	4
	1983-1984	4
	1984-1985	4
	1985-1990	5
	1990-1995	5
Question 2		*
Question 3	a,b,c	6
Question 4	a,b,c	6
Question 5	a,b,c	6
Question 6	a,b	6
Question 7	a	4
	b	3
Question 8	a	6
	b	4
Question 9	a	6
	b	6
	c	6
Question 10	a,b,c,d,e	6
Question 11	a,b,c,	6
	d	6
	e	6
	f	5

Question		Firms
Question 12	a,b,c,d,e	6
Question 13		*
Question 14	a	6
	b	0
	c	5
	d	0
Question 15	a	0
	b	0
	c	*
	d	0
	e	0
	f	0
	g	0
Question 16	a	6
	b	4
Question 17	a	4
	b	4
	c	4
	d	4
	e	3
	f	3
Question 18	a	6
	b	5
	c	3
	d	6
	e	2
	f	2

* Data not used and therefore, number of responses not reported.

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MANAGEMENT AND BUSINESS CONSULTANTS

Number of Firms and Unions Responding by Question

Question		Firms
Question 1	1982-1983	8
	1983-1984	8
	1984-1985	8
	1985-1990	8
	1990-1995	8
Question 2		*
Question 3	a,b,c	8
Question 4	a,b,c	8
Question 5	a,b,c	7
Question 6	a,b	7
Question 7	a	4
	b	2
Question 8	a	8
	b	4
Question 9	a	8
	b	8
	c	8
Question 10	a,b,c,d,e	8
Question 11	a,b,c,	8
	d	8
	e	7
	f	8

Question		Firms
Question 12	a,b,c,d,e	8
Question 13		*
Question 14	a	7
	b	0
	c	6
	d	0
Question 15	a	0
	b	0
	c	*
	d	0
	e	0
	f	0
	g	0
Question 16	a	6
	b	4
Question 17	a	8
	b	8
	c	8
	d	8
	e	7
	f	8
Question 18	a	8
	b	8
	c	5
	d	8
	e	3
	f	3

* Data not used and therefore, number of responses not reported.

APPENDIX C

RELIABILITY OF THE SAMPLE

SAMPLE RELIABILITY

The sample reliability is summarized with other sample and population characteristics in "Table 1". The sample was selected as a three stage stratified random sample. The purpose of this stratification was to reduce the error variance in the measurement of organization size by increasing the homogeneity of each group of organizations within each strata.

The first stage consisted in creating two industry sectors (i.e. manufacturing and services). The second stage involved dividing up each industry sector into nine and fourteen industrial sub-classes respectively and according to Standard Industrial Classification codes (see Table 1). The third stage was to further stratify each SIC into three more homogeneous size groups:

Manufacturing Sector		Service Sector
Small	20- 99 employees	20-199 employees
Medium	100-499 employees	200-999 employees
Large	500+ employees	1,000+ employees

Exceptions to these three size groupings are as follows:

SECTOR		ORGANIZATION SIZE EXCLUSION
Manufacturing Sector		
291	Iron & Steel Mills	less than 500
321	Aircraft & Aircraft Parts	less than 50
Service Sector		
701	Banks and Trusts	less than 50
721	General and Life Insurance	less than 50
735	Insurance Brokers	less than 50
909	Federal Government	less than 500
931	Provincial Government	less than 200
951	Local Government	less than 500

Overall, the sample yields a relatively high reliability level in reflecting the employment level of those sectors surveyed. For instance, the sample for the Management and Business Consultants yields a minimum confidence level of about 95 percent with an associated allowable error of 6 percent. That is, we would expect that the estimated employment level for the sector has a 95 percent chance of being within $\pm$ 6 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 95 of these samples we would expect to have an estimated employment level within $\pm$ 6 percent of the actual employment level found in the sample frame.

TABLE 1: SUMMARY - SELECTED SERVICE INDUSTRIES

SAMPLE FRAME AND SAMPLE

SIC	SIC NAME	UNIVERSE		SAMPLE FRAME				SAMPLE				
		Number of Firms	Number of Employees	Firm Size Cut Off	Number of Firms	Number of Employees	Share of Universe	Number of Firms	Number of Unions	Number of Employees	Reliability Level (min.) (Percent)	Allowable Error (Percent)
701	Chartered Banks	68	64,200	50	16	60,300	94	8		43,883	95	5
701	Trust Companies	41	20,000	50	22	19,000	95	6		8,466	90	15
721	Life Insurance	45	31,200	$10 MM	26	28,200	90	6		6,355	95	5
721	General Insurance	94	20,000	$10 MM	51	19,000	95	8		2,128	95	9
735	Insurance Brokers	2,737	31,600	50	45	6,300	20	8		1,213	90	11
909	Federal Government	67	91,000	500	22	69,000	76	8	2	28,350	90	11
931	Provincial Government	37	84,000	200	19	67,000	80	8		37,599	90	11
951	Local Government	837	107,474	500	39	83,782	78	10	7	23,832	90	13
544	Telephone Systems and Interconnects	111	30,423	20	37	29,430	97	8	1	26,444	90	23
545	Telegraph and Cable Systems	4	2,543	20	4	2,543	100	3	1	2,116	90	20
631	Food Stores	n.a.	87,600	100	45	85,000	97		Expert Interviews Only			
642	General Merchandise Stores	n.a.	92,000	100	12	76,000	83		Expert Interviews Only			
853	Computer Services	n.a.	16,775	20	41	11,800	70	6		291	90	17
867	Management and Business Consultants	n.a.	10,975	20	40	5,900	54	8		1,070	95	6

APPENDIX D

HISTORICAL TABLES

TABLE D.1

SOURCES OF OPERATING REVENUE FOR ESTABLISHMENTS ENGAGED PRIMARILY IN PROVIDING COMPUTER SERVICES, 1982

($ MILLIONS)

	CANADA		ONTARIO	
	$	%	$	%
Processing Services (batch, over the counter, remote job entry, and on-line interactive	648.3	48.0	335.8	44.7
Input Preparation (key punching, key-to-magnetic storage, etc.)	46.6	3.5	24.7	3.3
Software and Systems Services:				
Rental and Royalties of System and Application Software Package	38.7	2.9	25.1	3.4
Sales of Systems and Application Software Packages	96.2	7.1	65.6	8.7
Systems Development and Maintenance	181.8	13.5	92.9	12.4
Consulting Services	131.0	9.7	83.9	11.2
Other Software and Systems Services	8.3	0.6	3.3	0.4
Other computer services (education)	37.3	2.8	30.3	4.0
Sales and Rentals of Computing and Other EDP Equipment Purchased or Manufactured for Rental or Resale				
Sales	79.9	5.9	42.6	5.7
Lease or Rental	25.2	1.9	12.9	1.7
Equipment Maintenance Service	29.0	2.2	20.5	2.7
Other Operating Revenue	25.4	1.9	13.7	1.8
Total Operating Revenue	1,347.7	100.0	751.4	100.0
Non-Operating revenue	9.8		5.3	
TOTAL	1,357.5		756.7	

NOTE: Details may not add to totals due to rounding.

SOURCE: Statistics Canada, Computer Services Industry, Cat. No. 63-222.

TABLE D.2

SOURCES OF OPERATING REVENUE FOR ESTABLISHMENTS ENGAGED IN THE LEASE OR RENTAL OF EDP HARDWARE, 1982

($ MILLIONS)

	CANADA	ONTARIO*
Processing	X	X
Software Systems Services	X	X
Consulting Services	X	X
Other Computer Services (education, input preparation)	20.8	11.4
Sales and Rental of Computing and Other EDP Equipment Purchased for Rental or Resale or Manufactured for Rental or Sale		
Sales	X	X
Lease or Rentals	674.1	370.8
Equipment maintenance services	207.7	114.2
Other Operating Revenue	0.4	0.2
TOTAL OPERATING REVENUE	1,845.9	1,015.2

X Confidential to meet secrecy requirements of the Statistics Act.

* Estimates by Economics Practice, Currie, Coopers & Lybrand assuming that approximately 55% of total Canadian activity occurs in Ontario.

SOURCE: Statistics Canada, Computer Services Industry, Cat. No. 63-222.

TABLE D.3

TOTAL OPERATING REVENUES IN THE COMPUTER SERVICE INDUSTRY IN ONTARIO

($ MILLIONS)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
CURRENT DOLLARS											
Computer Service	NA	NA	126.0	178.0	188.5	249.7	312.4	378.8	476.8	643.6	751.4
Percent Change	NA	NA	-	41.3	5.9	32.5	25.1	21.3	25.9	35.0	16.7
Lease/Rent	NA	NA	336.6	356.8	396.4	438.4	483.9	511.4	610.9	776.2	1,015.2
Percent Change	NA	NA	-	6.0	11.1	10.6	10.4	5.7	19.5	27.1	30.8
Total Operating Revenue	294.2	324.3	462.6	534.8	584.9	688.1	796.3	890.2	1,087.7	1,419.8	1,766.6
Percent Change	-	10.2	42.6	15.6	9.4	17.6	15.7	11.8	22.2	30.5	24.4
CONSTANT 1971 DOLLARS											
Computer Service	NA	NA	95.4	121.7	117.5	144.9	170.0	186.9	211.2	257.7	272.7
Percent Change	NA	NA	NA	27.6	(3.5)	23.3	17.3	9.9	13.0	22.0	5.8
Lease/Rent	NA	NA	254.8	243.9	247.1	254.4	263.3	252.3	270.5	310.9	368.5
Percent Change	NA	NA	NA	(4.3)	1.3	3.0	3.5	(4.2)	7.2	14.9	18.5
Total Operating Revenue	280.2	283.0	350.2	365.6	364.6	399.3	433.3	439.2	481.7	568.6	641.2
Percent Change	-	1.0	23.7	4.4	(0.3)	9.5	8.5	1.4	9.7	18.0	12.8

() Indicates decline.

NOTE: Data is estimated by Economics Practice, Currie, Coopers & Lybrand assuming that 55 percent of total Canadian activity occurs in Ontario. Current dollar data is deflated by the Implicit Price Index for Gross National Expenditure for Canada, as available in Statistics Canada, National Income and Expenditure Accounts, Cat. No. 13-201.

SOURCE: Statistics Canada, Computer Service Industry, Cat. No. 63-222.

TABLE D.4

AVERAGE REVENUE PER EMPLOYEE IN ONTARIO

($ THOUSANDS)

	SERVICE FIRMS	RENT/LEASE FIRMS*
1978	42.0	99.4
1979	45.7	98.2
1980	48.5	113.7
1981	56.8	140.4
1982	61.0	183.4

* Based on Canada level data.

SOURCE: Statistics Canada, Computer Service Industry, Cat. No. 63-222.

TABLE D.5

COMPUTER SERVICE INDUSTRY

TOTAL EMPLOYEES IN ONTARIO

	Computer Services	Lease & Rent* of Hardware	Total
1972			7,900.2
1973			7,810
1974	4,814	5,204	10,018
1975	5,430	5,226	10,656
1976	5,350	4,910	10,260
1977	6,303	4,588	10,891
1978	7,456	4,870	12,326
1979	8,281	5,207	13,488
1980	9,820	5,371	15,191
1981	11,340	5,530	16,870
1982	12,318	5,536	17,854

* These numbers are estimated assuming Ontario has 55% of total Canadian activity.

SOURCE: Statistics Canada, Computer Service Industry, Cat. No. 63-222.

TABLE D.6

OCCUPATIONAL INDICATORS: COMPUTER SERVICES

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	16,775	23.2
II	TWO DIGIT LEVEL		
	CLERICAL AND RELATED	4,870	19.5
	SALES	815	24.0
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	6,505	25.2
	MANAGERIAL, ADMINISTRATIVE AND RELATED	2,485	26.1
III	FOUR DIGIT LEVEL		
	CLERICAL AND RELATED		
	Typists and Clerk-Typists	145	10.2
	Supervisors, Office Machine and Electronic Data-Processing Equipment Operators	250	10.8
	Other Clerical and Related, n.e.c.	130	14.0
	General Office Clerks	185	16.5
	Secretaries and Stenographers	655	19.0
	Electronic Data-Processing Equipment Operators	2,245	20.1
	Receptionists and Information Clerks	115	22.6
	Bookkeepers and Accounting Clerks	550	24.8
	TOTAL	4,870	19.5
	SALES		
	Commercial Travellers	190	22.5
	Technical Salesmen and Related Advisors	400	38.9
	TOTAL	815	24.0

TABLE D.6 Cont'd.

OCCUPATIONAL INDICATORS: COMPUTER SERVICES

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Systems Analysts, Computer Programmers and Related	5,345	25.1
Electrical Engineers	325	26.9
Industrial Engineers	165	27.1
Architectural and Engineering Technologists and Technicians	450	31.1
TOTAL	6,505	25.2
MANAGERIAL, ADMINISTRATIVE AND RELATED		
Management: Natural Sciences, Engineering and Mathematics	290	*
Occupations Related to Management and Administration, n.e.c.	320	15.6
General Managers and Other Senior Officials	300	17.5
Accountants, Auditors and Other Financial Officers	330	22.0
Production Management	120	23.1
Personnel and Related Officers	110	27.1
Sales and Advertising Management	315	35.6
Other Managers and Administrators, n.e.c.	395	38.7
TOTAL	2,485	26.1

* There were no employees in this classification in 1971.

NOTE: Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.7

OCCUPATIONAL INDICATORS: COMPUTER SERVICES

RANKING BY INCREASE IN FEMALE REPRESENTATION

		FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I.	TOTAL INDUSTRY	5,870	36.2	35.0	5,110
II.	TWO DIGIT LEVEL				
	SALES	190	5.3	23.3	185
	MANAGERIAL, ADMINISTRATIVE AND RELATED	640	8.2	25.8	620
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	1,270	10.9	19.5	1,195
	CLERICAL AND RELATED	3,450	74.4	70.8	2,840
III.	FOUR DIGIT LEVEL				
	SALES				
	Commercial Travellers	50	0.0	26.3	50
	Technical Salesmen and Related Advisors	85	0.0	21.3	85
	TOTAL	190	5.3	23.3	185
	MANAGERIAL, ADMINISTRATIVE AND RELATED				
	General Managers and Other Senior Officials	5	0.0	1.7	5
	Production Management	15	0.0	12.5	15
	Sales and Advertising Management	35	0.0	11.1	35
	Management: Natural Sciences, Engineering and Mathematics	40	0.0	13.8	40
	Personnel and Related Officers	60	50.0	54.5	55
	Other Managers and Administrators, n.e.c.	130	33.3	32.9	125
	Accountants, Auditors and Other Financial Officers	135	11.1	40.9	130
	Occupational Related to Management and Administration, n.e.c.	140	6.7	43.8	135
	TOTAL	640	8.2	25.8	620

TABLE D.7 Cont'd.

OCCUPATIONAL INDICATORS: COMPUTER SERVICES

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
Electrical Engineers	10	0.0	3.1	10
Industrial Engineers	25	0.0	15.2	25
Architectural and Engineering Technologists and Technicians	30	0.0	6.7	30
Systems Analysts, Computer Programmers and Related	1,165	13.2	21.8	1,090
TOTAL	1,270	10.9	19.5	1,195
CLERICAL AND RELATED				
Other Clerical and Related, n.e.c.	65	85.7	50.0	35
Typists and Clerk-Typists	135	100.0	93.1	80
Supervisors, Office Machine and Electronic Data-Processing Equipment Operators	125	33.3	50.0	95
Receptionists and Information Clerks	110	100.0	95.7	95
General Office Clerks	140	75.0	75.7	110
Bookkeepers and Accounting Clerks	485	66.7	88.2	445
Secretaries and Stenographers	655	100.0	100.0	540
Electronic Data-Processing Equipment Operators	1,450	73.6	64.6	1,185
TOTAL	3,450	74.4	70.8	2,840

NOTE: Females employed in 1981 is calculated from percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.8

ESTIMATED OPERATING REVENUE OF MANAGEMENT CONSULTING ESTABLISHMENTS IN ONTARIO

($ MILLIONS)

	$ CURRENT	$ CONSTANT 1971
1973	20.5	17.9
1974	22.3	16.9
1975	23.3	15.9
1976	25.5	15.9
1977	27.6	16.0
1978	33.5	18.2
1979	34.8	17.2
1980	41.0	18.2
1981	54.4	21.8
1982	60.0	21.8
1983	60.6	20.9

SOURCE: Canadian Association of Management Consultants. Estimates are based on actual survey results, deducting data processing revenue and grossing results up to 100 percent. Current dollar data is deflated by the Implicit Price Index Per Gross National Expenditure as available in Statistics Canada, National Income and Expenditure Accounts, Cat. No. 13-201.

TABLE D.9

OCCUPATIONAL INDICATORS: OFFICES OF MANAGEMENT AND BUSINESS CONSULTANTS

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	10,975	17.2
II	TWO DIGIT LEVEL		
	SALES	260	14.0
	CLERICAL AND RELATED	2,840	16.4
	MANAGERIAL, ADMINISTRATIVE AND RELATED	3,590	17.0
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	2,845	19.7
III	FOUR DIGIT LEVEL		
	CLERICAL AND RELATED		
	Typists and Clerk-Typists	145	9.2
	Secretaries and Stenographers	935	12.8
	General Office Clerks	210	18.0
	Electronic Data-Processing Equipment Operators	135	21.0
	Receptionists and Information Clerks	195	22.8
	Bookkeepers and Accounting Clerks	805	26.8
	TOTAL	2,840	16.4
	MANAGERIAL, ADMINISTRATIVE AND RELATED		
	General Managers and Other Senior Officials	310	7.9
	Accountants, Auditors and Other Financial Officers	565	13.4
	Occupations Related to Management and Administration, n.e.c.	1,485	17.2
	Personnel and Related Officers	305	19.8
	Other Managers and Administrators, n.e.c.	445	27.2
	Sales and Advertising Management	110	36.2
	TOTAL	3,590	17.0

TABLE D.9 Cont'd.

OCCUPATIONAL INDICATORS: OFFICES OF MANAGEMENT AND BUSINESS CONSULTANTS

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Supervisors, Other Occupations in Architecture and Engineering	285	*
Civil Engineers	105	3.4
Draughtsmen	100	11.1
Mathematicians, Statisticians and Actuaries	135	12.9
Industrial Engineers	1,115	16.6
Architects and Engineers, n.e.c.	300	28.2
Systems Analysts, Computer Programmers and Related	515	32.9
TOTAL	2,845	19.7

* There were no employees in this classification in 1971.

NOTE: Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

TABLE D.10

OCCUPATIONAL INDICATORS: OFFICES OF MANAGEMENT AND BUSINESS CONSULTANTS

RANKING BY INCREASE IN FEMALE REPRESENTATION

		FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I.	TOTAL INDUSTRY	4,905	34.1	44.7	4,145
II.	TWO DIGIT LEVEL				
	SALES	85	28.6	32.7	65
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	460	7.4	16.2	425
	MANAGERIAL, ADMINISTRATIVE AND RELATED	1,235	12.7	34.4	1,140
	CLERICAL AND RELATED	2,605	86.3	91.7	2,070
III.	FOUR DIGIT LEVEL				
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
	Civil Engineers	5	0.0	4.8	5
	Draughtsmen	15	28.6	15.0	5
	Mathematicians, Statisticians and Actuaries	15	12.5	11.1	10
	Architects and Engineers, n.e.c.	45	0.0	15.0	45
	Supervisors, Other Occupations in Architecture and Engineering	80	0.0	28.1	80
	Systems Analysts, Computer Programmers and Related	115	33.3	22.3	105
	Industrial Engineers	155	4.2	13.9	145
	TOTAL	460	7.4	16.2	425

TABLE D.10 Cont'd.

OCCUPATIONAL INDICATORS: OFFICES OF MANAGEMENT AND BUSINESS CONSULTANTS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MANAGERIAL, ADMINISTRATIVE AND RELATED				
Sales and Advertising Management	30	0.0	27.3	30
General Managers and Other Senior Officials	60	6.9	19.4	50
Personnel and Related Officers	115	20.0	37.7	105
Accountants, Auditors and Other Financial Officers	190	9.4	33.6	175
Other Managers and Administrators, n.e.c.	300	37.5	67.4	285
Occupations Related to Management and Administration, n.e.c.	420	13.1	28.3	380
CLERICAL AND RELATED				
Electronic Data-Processing Equipment Operators	95	75.0	70.4	115
Typists and Clerk-Typists	145	83.3	100.0	85
General Office Clerks	180	75.0	85.7	170
Receptionists and Information Clerks	190	100.0	97.4	170
Secretaries and Stenographers	930	98.2	99.5	655
Bookkeepers and Accounting Clerks	740	86.7	91.9	730
TOTAL	2,605	86.3	91.7	2,220

NOTE: Females employed in 1981 is calculated from percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

FINAL REPORT AND APPENDICES OF THE ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Final Report — Employment and New Technology

Appendices:

1. Labour Market Trends in Ontario, 1950-1980
2. Occupational Employment Trends in Ontario, 1971-1981
3. Emerging New Technology, 1985-95: Framework for a Survey of Firms
4. Employment and New Technology in Ontario's Manufacturing Sector: A Summary of Selected Industries
5. Employment and New Technology in the Iron and Steel Industry
6. Employment and New Technology in the Metal Fabricating Industry
7. Employment and New Technology in the Machinery and Equipment Industry
8. Employment and New Technology in the Aircraft and Aircraft Parts Industry
9. Employment and New Technology in the Communications Equipment Industry
10. Employment and New Technology in the Office, Store and Business Machine Industry
11. Employment and New Technology in the Plastic Processing Industry
12. Employment and New Technology in Ontario's Service Sector: A Summary of Selected Industries
13. Employment and New Technology in the Chartered Banks and Trust Industry
14. Employment and New Technology in the Insurance Industry
15. Employment and New Technology in the Government Services Industry
16. Employment and New Technology in the Telecommunications Industry
17. Employment and New Technology in the Retail Trade Industry
18. Employment and New Technology in the Computer Services and Management Consulting Industry
19. Industry-Sector and Occupational Employment in Ontario, 1985-1995
20. Technological Change, Productivity, and Employment: Studies of the Overall Economy